8 TO 10 TIMES LONGER LIFE!

(For Switch Rails)

Unbelievable? No,

just use

MACK REVERSIBLE SWITCH POINT PROTECTORS

Manufactured by Fleming Co., Scranton, Pa.

MAINTENANCE EQUIPMENT CO.

RAILWAY EXCHANGE BLDG. CHICAGO, ILLINOIS

Reliance HY-CROME *Spring Washers*

LOCOMOTIVE HY-CROME
Prevents
"Bolt Looseness"

Avoid
loose bolts—
Save locomotive
shop hours

Bolted assemblies are efficiently and economically maintained when equipped with Hy-Crome Spring Washers.

EATON MANUFACTURING COMPANY

RELIANCE SPRING WASHER DIVISION

MASSILLON, OHIO

Sales Offices: New York, Cleveland, Detroit, Chicago, St. Louis, San Francisco, Montreal

Published monthly by Simmons-Boardman Publishing Corporation, 105 W. Adams St., Chicago, Illinois. Subscription price: United States and Possessions, and Canada, $2.00; Foreign, $3.00. Single copies 35 cents. Entered as second-class matter January 20, 1935, at the postoffice at Chicago, Ill., under the act of March 3, 1879, with additional entry at Mount Morris, Ill., postoffice. Address communications to 105 W. Adams St., Chicago, Ill.

HIGH BRINELL for millions of impacts

More than 40 million wheels (8½ years' service) have passed over these Bethlehem Heat-Treated Crossings without excessive wear.

Primary requirement for a long-wearing crossing is hardness. Along with high Brinell, however, are two other requirements: all-round physical properties to withstand shock and pounding, and high initial resistance to flow or deformation.

With such requirements in mind, nine years ago Bethlehem developed a new type of crossing: a bolted crossing fabricated from machined, heat-treated steel rails specially designed to minimize wear.

This type of crossing is known as the Bethlehem Heat-Treated Crossing. The average Brinell hardness, taken from our records for 100-lb. and heavier rail, is 364, compared to 282 for average untreated rails. Contrasted with surface-hardened rails, its entire cross-section is uniformly hardened and toughened, giving much improved all-round physical properties: 27 per cent greater elastic limit; 37 per cent greater elongation; an Izod impact strength of seven foot-pounds, as contrasted with the usual two. Compared with manganese-steel castings, there is little initial deformation while the material work-hardens.

These first Bethlehem Heat-Treated Crossings were installed during the summer of 1931. At present they have been subjected to more than 40,000,000 wheel crossings. None has yet worn sufficiently that any build-up of points has been necessary.

If you have crossings coming up for replacement, we suggest that you investigate service records of Bethlehem Heat-Treated Crossings. They are helping many railroads cut track-maintenance costs.

BETHLEHEM STEEL COMPANY

BETHLEHEM STEEL

WOODINGS
RAIL ANCHOR

Unequalled

REAPPLICATION VALUE

Equally Efficient for

NEW OR WORN RAIL

Don't fail to attend the Roadmasters' and Maintenance of Way Convention, and the Track Supply Association Exhibit —September 10-12 — Hotel Stevens, Chicago

Woodings Forge & Tool Co.

Verona, Pa. **Chicago, Ill.**

FAIRMONT LEADS IN FEATURES THAT SERVE YOU BEST

8-13 H.P. ROLLER BEARING ENGINE

HY-DRIVE REDUCTION GEAR

STRUCTURAL STEEL CHASSIS

WATER COOLED

SEATS 12 MEN

THE Fairmont A2 SERIES "C" CAR

Has Plenty of Room and Power!

For Long Sections or Large Gangs

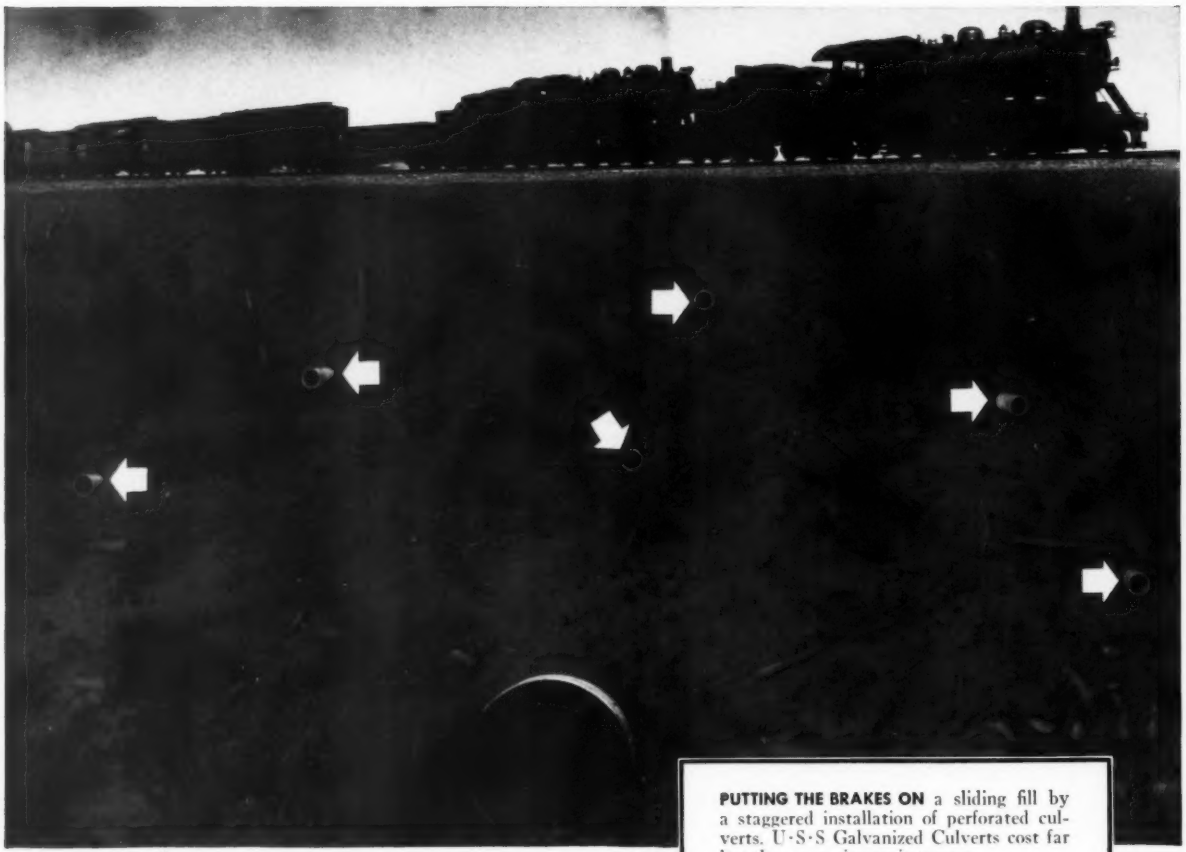
Railroads in increasing numbers are assigning their toughest section service jobs to the Fairmont A2 Series C car. Its extra large load capacity, sufficient for 12 men and their tools, its rugged construction and generous power reserve enable this car to carry or to tow big loads at low cost. This model has as standard equipment Fairmont's Hy-Drive Reduction Gear which further increases the drawbar pull. The structural steel chassis and rugged, spacious body are well built to withstand hard service and give years of economical performance. Bulletin 398 fully describes the A2 Series "C" car. Write for your copy. Also ask about other Fairmont equipment for your railroad. Fairmont Railway Motors, Inc., Fairmont, Minnesota.

OF ALL THE CARS IN SERVICE TODAY

More Than Half are Fairmonts

Performance ON THE JOB COUNTS

Curing a Soft Track and a Slide with **PERFORATED CULVERTS**



PUTTING THE BRAKES ON a sliding fill by a staggered installation of perforated culverts. U·S·S Galvanized Culverts cost far less than recurring maintenance.

THIS section of roadbed was a constant source of trouble. Hundreds of dollars had been poured into repairs but the slide still continued. Finally, perforated galvanized culverts were installed at various points in the bank and the excess water was drained off. The fill dried out and no more trouble was encountered.

Perforated galvanized culverts solve many difficult drainage problems. Wet hillsides above the track, impounded water in the subgrade, water pockets and slides can easily be cured at low cost with a properly designed drainage system.

U·S·S Perforated Galvanized Culverts are ruggedly built to withstand the pounding of heavy traffic and the strain of shifting soil. They can be obtained in either U·S·S galvanized steel, pure iron or rust resisting copper steel.

Write in for more information, prices and the names of U·S·S Culvert Manufacturers operating along your right-of-way.

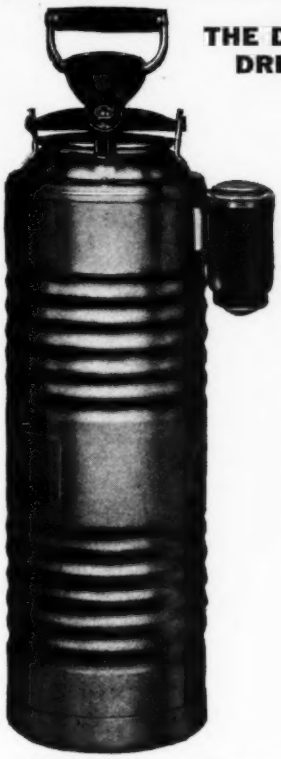
U·S·S GALVANIZED CULVERT SHEETS

CARNEGIE-ILLINOIS STEEL CORPORATION, *Pittsburgh and Chicago*
COLUMBIA STEEL COMPANY, *San Francisco*
TENNESSEE COAL, IRON & RAILROAD COMPANY, *Birmingham*
Scully Steel Products Company, Chicago, *Warehouse Distributors*
United States Steel Export Company, New York

UNITED STATES STEEL

INCREASED EFFICIENCY *and* PRODUCTION

ARE MADE POSSIBLE WHEN WORKMEN ARE SUPPLIED WITH COOL CLEAN WATER AND SALT NECESSARY TO MAINTAIN MUSCULAR ENERGY



THE DOBBINS PORTABLE DRINKING FOUNTAIN

supplies pure cool drinking water under complete sanitary conditions to crews of workmen and eliminates the necessity of pails, kegs, dippers and individual cups. The Dobbins Portable Drinking Fountain and Salt Dispenser saves the employer pay roll losses by supplying the necessary salt and water thus aiding in the prevention of heat prostration, cramps, etc., keeping the man on the job healthy and efficient. Regardless of where your men are employed, they can now be assured the same protection from disease spreading drinking equipment that is afforded in the bubbler drinking fountain used in modern industrial plants.

$12.50 LESS ACCESSORIES

OVER 100,000 DOBBINS PORTABLE FOUNTAINS ARE NOW IN USE

- **SANITARY**
- **ECONOMICAL**
- **DURABLE**
- **FOOL-PROOF**

MEETS THE REQUIREMENTS OF ALL PUBLIC HEALTH AUTHORITIES

Mounting Bracket . . . for inside and outside use. Easy attached to trucks, tractors, and locomotive cabs. Price Each **$4.50**

Spill Cup catches the over-flow when fountain is used indoors. One gallon capacity. Price Each **$3.50**

Carrying Strap Adjustable, Water-proof Carrying Strap. Price Each **$1.00**

Salt for MUSCULAR ENERGY

THE DOBBINS SALT DISPENSER capacity 500 tablets, is modern in design and smooth in performance. The salt tablet chamber has no metallic parts to cause corrosion or to prevent the dispenser from functioning. Top is transparent and THREADED on. Guide Cup is made of stainless steel. Protect workmen from loss of time due to heat prostration with salt and water—protect yourself against loss through higher workmen's compensation. **Price each, $2.75**

MAIL THIS COUPON TODAY!

DOBBINS MFG. CO.
Elkhart, Indiana

GENTLEMEN:

Please send me more information on the Dobbins Portable Drinking Fountains.

Firm Name .....

By .....

Address .....

R. E. M.

DOBBINS MANUFACTURING CO.
ELKHART, INDIANA

TO RAILWAY SUPPLY MANUFACTURERS

"It Helps"

"Bill, you've been running circles around the X..... Company lately. It certainly shows good work on your part," said the sales manager to his star salesman.

"I'm proud of that record, Boss," replied the salesman. "But I haven't done it alone."

"Who helped you?"

"You did, Boss, in a very real way."

"I did—what do you mean? I haven't been in your territory for years."

"It's the advertising that you've insisted on keeping running in Railway Engineering and Maintenance. That advertising keeps our materials before these railway men between my calls."

"Do you think so?"

"Think so? I know it. That magazine goes to practically all the men we've got to sell and they read it from cover to cover. It's their means of keeping up-to-date."

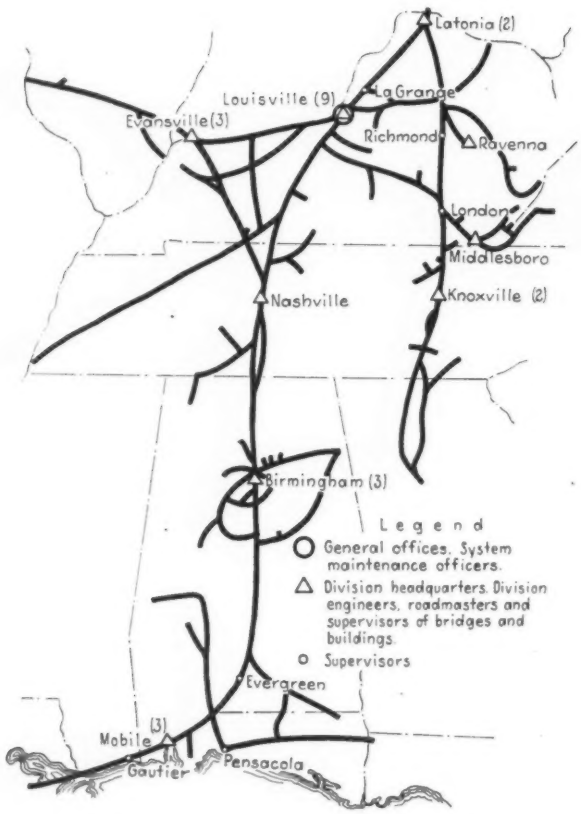
"But how do you know they read our advertising?"

"They tell me about it—they ask questions—and they're almost as well informed about our product as I am. It helps especially with the new men, who come to know our materials before they become officers. It saves a lot of my time—and it helps land a lot of orders when jobs break suddenly and I'm a thousand miles away."

"You think it's worth while then?"

"Boss, I'm out on the firing line chasing orders and I know it pays."

"That's what I wanted to know. It confirms my judgment."



Railway Engineering and Maintenance Goes Every Month to 31 Supervisory Maintenance Officers on the Louisville & Nashville at the **System Headquarters, at 9 Division Offices and 6 Other Supervisory Headquarters,** Scattered All the Way from Latonia, Ky., to Gautier, Miss. This Magazine Goes Also to 18 Other Subordinate Officers Who Are in Training for Promotion to Supervisory Positions on This Railway.

RAILWAY ENGINEERING AND MAINTENANCE IS READ BY MAINTENANCE OFFICERS OF ALL RANKS

C. B. & Q.'S FAMOUS TEST NOW GIVES CREOSOTED TIES AN AVERAGE LIFE OF OVER *28 years*

One of the test sections on the C.B.&Q. In the right background is an inspection group on annual check-up.

In 1909 and 1910, the Chicago, Burlington and Quincy installed thousands of experimental ties in its tracks to decide which kind of tie and kind of treatment would be the most economical to use in the various localities and under various traffic and climatic conditions.

Some of the ties were untreated; others were pressure-creosoted; still others were pressure treated with other preservatives. A thousand experimental ties were placed in each lot, as a rule, and at least one experimental lot was placed in each operating division.

The C. B. and Q. has kept a most accurate record of tie installation. The 30th annual inspection report has just been issued. The report shows the great superiority of pressure-creosoted ties over all others:

	Ties Removed *for* Decay After 30 Years	*for* Other Causes	Actual Average Life to Date
LINES WEST			
Creosoted Ties	17%	51%	28.5*
Ties treated by second process	34%	58%	17 9
Ties treated by third process	49%	50%	15.0
Untreated Ties	91%	9%	5.8
LINES EAST			
Creosoted Ties	25%	48%	28.0*
Ties treated by second process	34%	60%	19.1
Ties treated by third process	55%	44%	16.1
Untreated Ties	90%	10%	5.4

**Estimated years average life based on curve developed by Forest Products Laboratory and given only where 90% or less of ties have been removed.*

OTHER KOPPERS PRODUCTS

Coal . . . Coke . . . Coal Cleaning and Handling Systems . . . General Engineering and Construction . . . Roofing . . . Waterproofing . . . Cylinder Packing . . . American Hammered Piston Rings . . . D-H-S Bronze . . . Tar Base Paints . . . Weed Killers . . . Car Floats, Ferries . . . Tarmac Paving . . . Disinfectants, Insecticides

One of the Principal Suppliers OF PRESSURE-TREATED TIMBER TO THE RAILROADS:

THE WOOD PRESERVING CORPORATION

PITTSBURGH, PENNA.

a KOPPERS subsidiary

You Can HAVE BETTER TRACK AT LOWER COST

BARCO UNIT TYTAMPERS do a BETTER JOB *Quicker*

IN OUT OF FACE or SPOT TAMPING

BARCO
Type K-1 Light Weight Tytamper for all types of ballast and general tamping.

Each Unit is Self-Contained and
Easily Carried by ONE MAN
No Auxiliary Equipment is Needed

NOW **62 RAILROADS USE BARCO**
Five Years Satisfactory Service

Showing Power Plant—costing less than $100.00 and weighing less than 100 lbs. operating group of 12 **BARCO** Tytampers for out of face tamping.

BARCO MANUFACTURING COMPANY

1805 W. Winnemac Ave. Chicago, Illinois

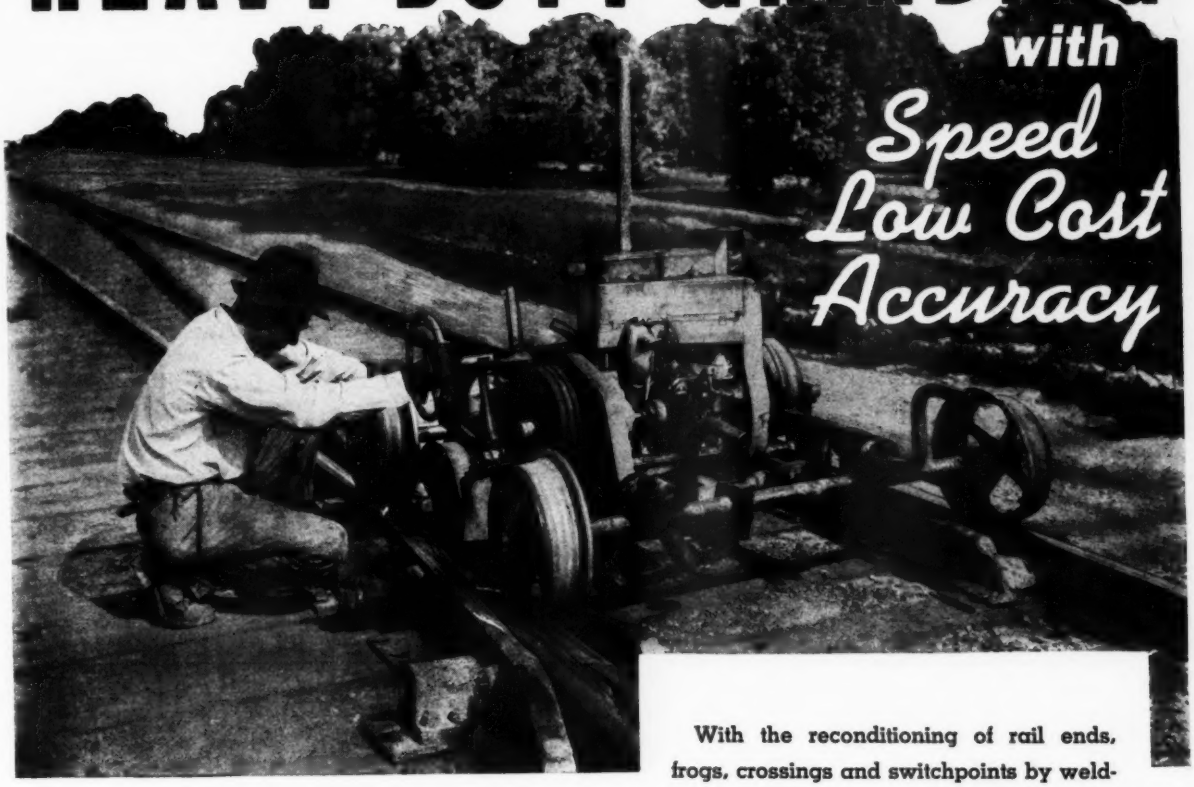
In Canada

THE HOLDEN COMPANY, LTD.

Montreal — Moncton — Toronto — Winnipeg — Vancouver

HEAVY DUTY GRINDING

with Speed Low Cost Accuracy



Nordberg Type BG Grinder working on a frog. A lighter weight model is also available for heavy traffic track and terminal work.

With the reconditioning of rail ends, frogs, crossings and switchpoints by welding methods, more and more grinding is being done in connection with track maintenance. To do each class of work with greatest efficiency, economy and precision, Nordberg working in conjunction with maintenance officials has developed several types of grinders for use on track.

The grinder shown here is especially adapted for grinding rail ends, frogs, etc., which have been built up by welding. Sturdily designed to take heavy cuts, speed and low cost per grinding job are secured. In addition, an accuracy of work is obtained in keeping with the high standards now demanded for track. If you have a grinding job, there is a Nordberg Grinder that will do it faster, cheaper and better.

NINE NORDBERG TOOLS FOR TRACK MAINTENANCE

Rail Grinder
Utility Grinder
Spike Puller
Power Jack
Precision Grinder
Adzing Machine
Track Wrench
Rail Drill
Track Shifter

NORDBERG MFG. CO. MILWAUKEE WISCONSIN

Export Representative—WONHAM Inc.—44 Whitehall St., New York

No. 138 of a series

Railway Engineering and Maintenance

SIMMONS-BOARDMAN PUBLISHING CORPORATION

105 WEST ADAMS ST.
CHICAGO, ILL.

June 1, 1940

Subject: Keeping Up-To-Date

Dear Reader:

"I am confronted with the problem of building a freight house in one of our most important cities and want to make this building conform to the latest trends in design, materials and use. I gain little help from the books that are available, for although some of them are not more than ten years old, freight handling practices are changing so rapidly that these books are entirely out of date. Can you help me?" This was the inquiry received a few days ago from a building department officer on a large railway.

"Where can I find information regarding the most efficient organization and equipment for a system rail-laying gang?" wrote the chief engineer of another railway.

Although these requests came from officers of railways in widely separated parts of the country and although the queries dealt with widely differing problems, our answer was essentially the same. It was to the effect that these are changing days in every phase of transportation activities and that they are making obsolete the methods and facilities of only a few years ago. These changes are occurring so rapidly that ordinary books of reference cannot keep up.

It is for this reason that we revise and re-issue our Railway Engineering and Maintenance Cyclopedia every third year. It is for this reason also that magazines like Railway Engineering and Maintenance have become so indispensable to the alert maintenance officer today, bringing to him strictly up-to-date information regarding changes in practices currently as they occur. This characteristic of the magazine has always been important. It is doubly important in these days of rapid and violent changes.

As you receive your magazine from month to month, do you realize how essential it is that you read it thoroughly, editorial and advertising pages alike, in order that you may keep abreast of the discoveries of others and have at your hand all the developments of railway men everywhere. In other words, can you afford not to be up-to-date in these days when so much is demanded and the rewards go to those who are abreast of the times?

Yours sincerely,

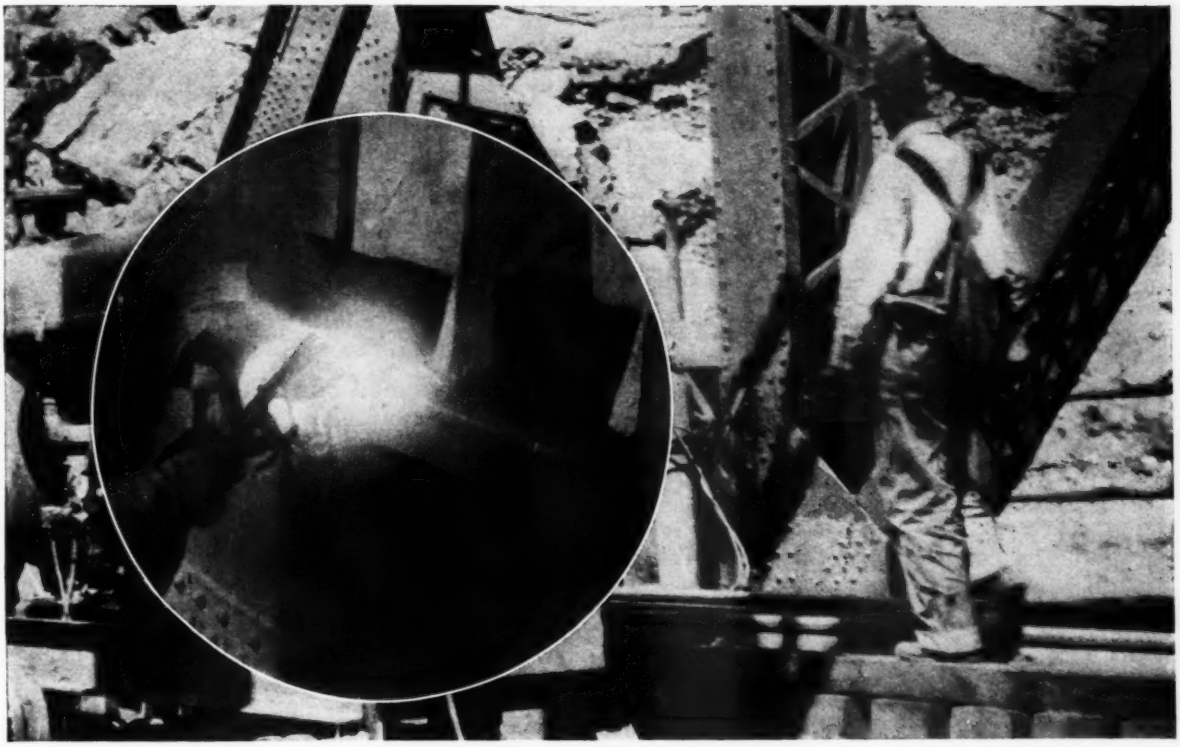
Elmer T. Howson

ETH:EW

Editor

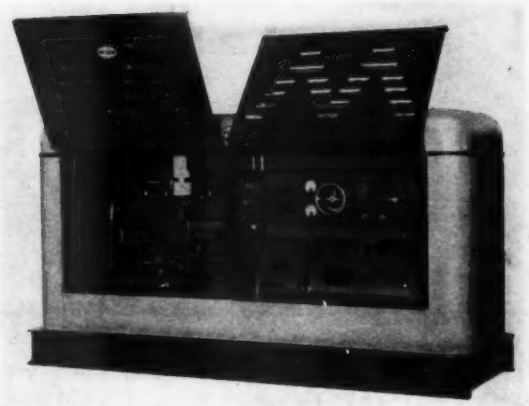
MEMBERS: AUDIT BUREAU OF CIRCULATIONS AND ASSOCIATED BUSINESS PAPERS, INC.

Add years to life of Railroad Bridges



Repair them with WILSON WELDERS

Railroad bridges can be repaired and strengthened —quickly and at great savings—with Wilson Welders. Experience has proved that the arc stability of the Wilson "Yellow Jacket" shown here—and of all other machines that complete the Wilson line of machines "that make the arc behave"—enables operators to consistently master difficult welding conditions often encountered in this type work. When used with economical, high-strength Airco electrodes, Wilson Machines assure strong welds from start to finish of the job. Write for full details.



WILSON **AIR REDUCTION**

General Offices: 60 EAST 42nd ST., NEW YORK, N. Y., DISTRICT OFFICES IN PRINCIPAL CITIES

● SERVING RAILROADS FROM COAST TO COAST ●

Do Weeding Costs Deceive You?

Chemical weed killer is not a luxury. Study ALL the costs that result from "doing without" or from using less effective methods of temporary value. Many weed control programs look cheap only because so many elements of cost are hidden.

The costs of chemical weed killing are clearly defined—consider these compared with the TOTAL costs of inadequate weed control.

KILL THE ROOTS to Maintain Good Track

Use ATLACIDE or ATLAS "A" to Kill the Roots

ATLACIDE
CHLORATE WEED KILLER

ATLAS "A"
ARSENICAL

The Standard Railroad Weed Killers

CHIPMAN CHEMICAL COMPANY, INC.

BOUND BROOK, N. J.

Chicago, Ill. Palo Alto, Calif. Houston, Tex.
No. Kansas City, Mo. Winnipeg, Manitoba.

Railway Engineering and Maintenance

NAME REGISTERED U. S. PATENT OFFICE

JUNE, 1940

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The many responsibilities in this regard are pointed out in this report, which was presented before the Big Four Foremen's Association

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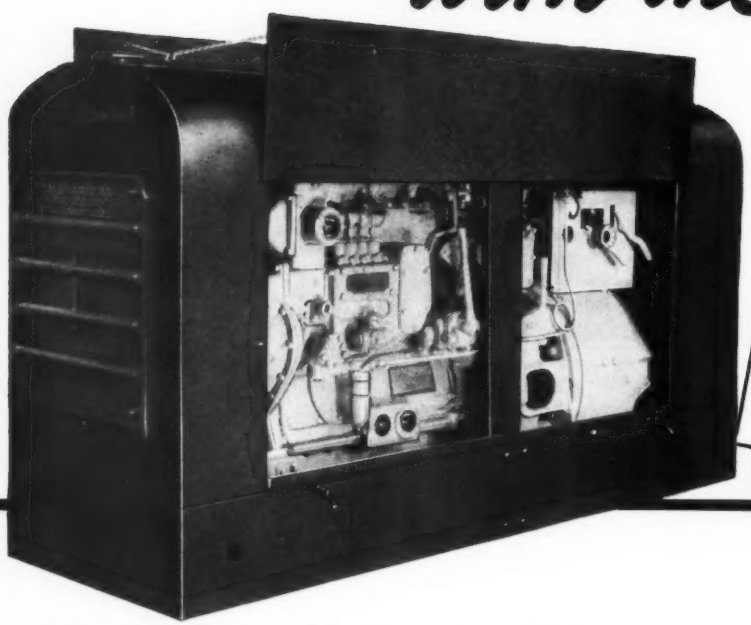
IN YOUR 1940 MAINTENANCE PROGRAM

Cut WELDING COSTS with the NEW G-E "Caterpillar" Diesel-driven Arc Welder



IF your 1940 plans include welding for general maintenance on track and structures, don't fail to investigate the new G-E "Caterpillar" diesel-driven arc welder. It's the lowest-priced welder providing both the inherent fuel economy of a diesel and the dependable performance which permits this economy to be *fully* realized.

"Caterpillar" Diesel Engine

Here's why the "Caterpillar" diesel engine is outstanding for welding service:

(1) Gasoline engine starter provides easy starting, even in cold weather.

(2) Simplicity—only three working adjustments, none on the fuel system.

(3) A fuel system which burns a wide range of diesel fuels with smooth idling, fast pickup, and reliable operation.

(4) Woven fuel-oil filter prolongs useful life of fuel injection pumps and valves.

(5) Force-feed lubrication with a separate oil cooler and a two-stage filter assures adequate lubrication, increases oil life, and avoids excessive maintenance.

(6) Special oil-bath air cleaners on both diesel and starting engine assure clean combustion air and prolong engine life.

(7) An engine-mounted radiator and an automatic thermostat make for a trouble-free cooling-water system.

(8) An hour meter indicates when various engine parts should be lubricated.

G-E Welding Generator

Time and electrodes ordinarily account for over 80 per cent of the cost of arc welding. The G-E welding generator provides the following two essential electrical characteristics which produce attractive savings in these two important cost items:

(1) Instant recovery of voltage to more than 100 per cent of the arc voltage required at any current—permits easy striking and maintenance of the arc—prevents time-wasting arc pop-outs, even on vertical welding.

(2) Limitation of current peaks to 250 to 275 per cent of steady short-circuit current—permits quick striking of the arc and efficient deposition of metal—avoids excessive weld spatter, also sluggishness and sticking of the electrode.

The reliability and over-all welding economy of G-E "Caterpillar" diesel-driven welders have been proved. The first unit has been in successful operation for more than a year. Ask your G-E transportation representative for further information.

GENERAL ELECTRIC CO., SCHENECTADY, N. Y.

G-E ELECTRODES CUT COSTS, TOO

G-E electrodes may be used on work requiring approval by the Hartford Steam Boiler Inspection and Insurance Co. and other recognized authorities. Frequently used in railroad work are:

W-90 for rail-end batter
W-84, -85 for frogs, crossings
W-22 for bridges
W-20 for maintenance, repairs

Write for *Arc Welding Electrodes*, GEA-1546. It gives valuable information on all types and procedures for mild steel, high-tensile steel, and cast iron.

GENERAL ELECTRIC

Railway Engineering and Maintenance

Air Ports

Another Form of Public Subsidy

IN these days when the railways are facing such rapidly increasing competition for passenger traffic from so many quarters, no agency is showing as spectacular increases as the air lines. Here the traffic increased 34 per cent last year. It has shown further gains of 64 per cent in the first four months of this year. These increases are being recorded at a time when the railways showed increases of only 4.8 per cent and approximately 4 per cent for 1939 and for the first four months of 1940, respectively.

This unusually rapid increase in passenger traffic on the air lines is due to several causes, one of the most important of which is the reduction in fares that are being put into effect. These reductions are bringing the cost of air travel, in many instances, to levels not far above those for first-class, one-way rail travel in Pullman accommodations. Providing a service that is inherently more expensive, it is difficult, at first glance, to understand how such fares are possible.

Air Port Construction

However, even a superficial analysis brings to light one contribution to operating costs that runs into large figures. This is the public subsidy through air ports. According to the report on Public Aids to Transportation, prepared by the Section on Research of the staff of the Federal Co-ordinator of Transportation and released during the last month, the investment in publicly-owned air ports used by scheduled air carriers amounted to $153,980,067 at the end of 1938. Presumably this figure does not include the $40,000,000 in city and federal funds that has just been spent for the new municipal landing field in New York City. Neither does it include the large amounts that are about to be spent by the city of Chicago in enlarging its municipal air port, or the amounts that are being expended by other cities throughout the country to provide terminal facilities through which commercial air lines may compete with the railways for passenger traffic.

In striking contrast, in these same cities, the railways are required to provide their own terminal facilities, at their own cost, frequently being forced to add to their necessary expenses large amounts for civic improvements not essential to their railway needs. And then the railways are required to pay taxes on this entire investment, part of which go for the construction of these air port facilities in many cities to enable the air lines to take passenger traffic away from the railways.

Operation

Having avoided the necessity for spending these large sums for the provision of facilities for the care of their traffic, comparable with the terminals that the railways provide and maintain, it would normally be expected that the air lines would pay the full operating costs and a fair return on the investment in the facilities provided for their use. Yet the report on Public Aids to Transportation shows that the scheduled air carriers paid only $2,200,000 in 1938 for the use of these facilities, although the maintenance and operating costs alone of the facilities used by these commercial air lines amounted to $3,178,000. In other words, these commercial air lines paid only about two-thirds of the operating costs of these air ports, properly chargeable to their use of these facilities. And this is only part of the story, for these charges include no provision for interest on the heavy investment in these facilities, for depreciation, obsolescence, etc., which charges, if added, would bring the total annual subsidy to these scheduled air carriers through their use of publicly-owned air ports to some $15,000,000 a year.

Turning to a specific illustration, the city, state and federal governments furnished some $7,000,000 to build an air port at Boston. These facilities cost the city some $82,000 for operation and interest in 1938, without any provision for retirement of the debt; yet the total income from the air port was only $12,000. Taking all city, state and federal costs into account, it is estimated that this public subsidy, due to the air port alone, exceeds $3 per passenger landing at or taking off from this air port. In this same city, the railways have built two large and complete passenger terminals without expense to the public. One of these, the South Station, alone involved an expenditure of $16,000,000 by the two railroads served. Furthermore, the taxpayers pay nothing for its operation or maintenance. Instead, the city of Boston collects about $170,000 a year in taxes on this station for the support of government, while the air port is tax-free. Similar comparisons may be made in other cities throughout the country.

And the public subsidy is not limited to the non-compensatory use of air ports. On the contrary, it ramifies

into even larger aids in other directions. Take the expenses incurred by the federal and other governmental agencies for the lighting of airways and the protection and guidance of scheduled planes flying thereon, which, for the years 1926 to 1938, are estimated in the report on Public Aids to Transportation to have totaled $33,672,000. For the four years 1935-38, inclusive, expenditures for these purposes averaged more than $3,500,000 per year. Still another subsidy arises from the excess of payments over assigned costs for the transportation of air mail, this excess for the years 1931-38, inclusive, being estimated at $64,654,000, at the rate of more than $8,000,000 a year.

These three subsidies for air ports, for federal airways and related services, and for excess of mail payments over costs, are estimated in the report on Public Aids to Transportation to aggregate $120,431,000—a very sizable sum even in these days of astronomical figures. With these figures in mind it is not surprising that this study contains the conclusion "that this industry has not been able in the period ending with 1938 to attain a self-sufficient status" and also that still further and "enlarged expenditures for airways, airway services and air ports required for safe and efficient operation will undoubtedly be made by the government."

"Don't Help the Bear"

This is the status of the railways' newest competitor, an industry with a strong appeal to public imagination, but an industry that is still unable to stand on its own feet. It is only by reason of public assistance that it is able to take from the railways a very appreciable volume of traffic that they need and that they are prepared to handle. The unfairness of such competition should be evident to all. It warrants exploitation at this time when the proponents of air transportation are making such broad claims for its superiority.

No one should complain if traffic goes to that agency which renders the most efficient and economical service, all conditions being equal. Railway employees and advocates of fair play in industry have a right, however, to reiterate the old colored man's prayer, "Oh, Lord, if you won't help me, please don't help the bear."

Laying Rail

Must Not Sacrifice Quality for Speed

ANY maintenance of way foreman or supervisory officer who is tempted to seek speed records in laying rail at the sacrifice of quality work, and, in fact, any higher railway officer who is prone to demand speed of production out of keeping with the highest quality of work, should read the paper in this issue by J. B. Martin, general supervisor of track, New York Central, who, out of his long experience in practical track work, points out the disadvantages and net economic loss of excessive speed in laying rail at the expense of good workmanship.

In the efforts of the railways to expedite their work programs and to cut costs to a minimum, great emphasis has been placed in recent years upon the speed with which rail should be laid, this assuming, in some cases, the aspect of a contest on individual roads and a matter of keen rivalry between different roads. Laudable as is the intent in this regard, the question may well be raised whether this has not received over-emphasis on a number of roads, because experience has shown that increased production gained through hurried operations involving work of other than the highest quality is not consistent with reduced maintenance costs, prolonged life of the track materials, and ultimate overall economy. In view of this, Mr. Martin's comments are most timely.

No one questions the importance of carrying out rail laying operations, or, as a matter of fact, any other maintenance of way operations, in the most expeditious manner, in an endeavor to achieve the lowest possible costs, but, as Mr. Martin points out clearly, there is danger in speed if large production is secured at the expense of quality work, and the apparent low cost secured will prove to be poor economy when increased maintenance costs and reduced rail life are taken into consideration. The primary consideration of the track forces in laying rail, he says, should be quality work, combined with the lowest cost possible through the use of carefully organized forces and suitable equipment.

Elaborating on this principle, and, on the premise that the life of rail is determined largely by the care exercised in laying it and by the attention which it receives during the first six months of its service life, the author condemns certain practices that are still tolerated on many roads, most of which are born of a desire for speed, including the dropping of rail when unloading it; the joining up of rails with poorly lubricated or dirty ends and joint bars, particularly the fishing areas; inattention to the correct temperature of the rail as laid and the use of inaccurate expansion allowance shims; inaccuracy in the application of joint bars; lack of uniformity in the tightening of joint bolts; poor spiking; and careless or delayed application of anti-creepers. All of these factors, he shows, affect the life of the track materials adversely and result in increased subsequent maintenance costs, which, together, far outweigh any temporary saving which may appear in the cost of the rail laying operations themselves.

It is to the credit of maintenance men that they have speeded up many of their routine operations and are constantly on the alert to find ways and means of carrying out their work more expeditiously. However, experience has shown that, from the standpoint of true economy, they must obtain these ends through greater efficiency in organization, improved supervision, and the more extensive and effective use of work equipment, and not through excessive haste, which is conducive to carelessness, slighted details and inferior workmanship. This becomes of particular importance in laying rail as road after road is adopting heavier and more expensive sections, the damaging of which, either while laying it or immediately thereafter under traffic, becomes a matter of greater expense and concern. To get the maximum life from rail it must be unloaded properly, laid properly, anchored properly, and quickly and carefully surfaced

after being laid, because only in this way can the maximum return be secured from the investment in it. Maintenance men must not lose sight of this fact under any urge within themselves or on the part of others to attempt to effect a few cents saving per ton in the cost of laying rail, because to do so will prove poor economy.

Water Stations

A New Period of Reconstruction at Hand

IT may be a trite observation that nothing on a railway is static; yet the truth of this statement is being demonstrated daily in the water-service field. Beginning around 1900, or somewhat earlier on a few roads, there was an almost complete reconstruction of railway water facilities during the following decade. Then about 1913, a second cycle of reconstruction began which involved practically all water facilities, and which extended to about 1930. During this cycle many water stations were enlarged or were equipped with facilities for softening the water delivered to locomotives. In not a few cases the reconstruction involved relocations to obtain better spacing of the water stops, to insure an adequate supply or to obtain water of better quality. In some cases, the water facilities at a few points were rebuilt twice during this period.

At the same time there was a marked trend away from the intermittent and toward adoption of the continuous process of treating locomotive waters, as well as toward the erection of steel tanks to provide greater storage and treating capacity. The early part of this second cycle also saw a large expansion in the use of internal-combustion engines for pumping water. During the later stages of this period, electric power became more widely available and electric motors and centrifugal pumps began to replace older designs of power units and pumps, particularly where conditions were favorable for automatic operation of the pumping equipment.

From 1930 to about 1937 there was a marked lull in all water-service activities as traffic receded, for many water stations that had about reached the limit of their capacity now had an ample margin for all current requirements. This does not mean that all improvements ceased, for the extension of water softening continued, although on a reduced scale, and not a few of the older plants were changed to electric operation. About 1935, however, new conditions arose as locomotive tanks began to increase in size and as the movement toward shortened schedules got under way.

As the influence of these factors developed rather slowly at first, with a few exceptions they had little effect on water stations for two or three years, primarily because there was not a sufficient increase in traffic to offset the margin of safety of the supplies that had been created by the original recession in traffic. With the notable upturn in traffic that has occurred in recent months, these latest factors are making themselves felt to an increasing degree on many roads. Word comes from many sources that what will amount to a widespread revision of water facilities is now facing water engineers. As all train schedules continue to be shortened and freight train speeds have begun to exceed those that were considered fast for passenger trains no longer than five years ago, and as more and more locomotives are being equipped with the larger tenders, the requirements for locomotive water supplies are changing completely in not a few instances.

Thus the water-service facilities, like many others on the railways, are never finished, for no sooner has a cycle of reconstruction been completed than new conditions or new demands arise, more efficient or more effective equipment becomes available or new methods are developed that make obsolete plants that had been satisfactory in operation and adequate in capacity. For this reason, no water-service officer is in position to say that when he has completed a cycle of modernization of his plants, they will remain modern. On the other hand, it is the experience of more than a half century that water requirements are changing constantly, that facilities that are adequate and satisfactory today may be entirely unsatisfactory or inadequate tomorrow, and that it requires continuous effort to keep abreast of these changing needs.

Blast Plates

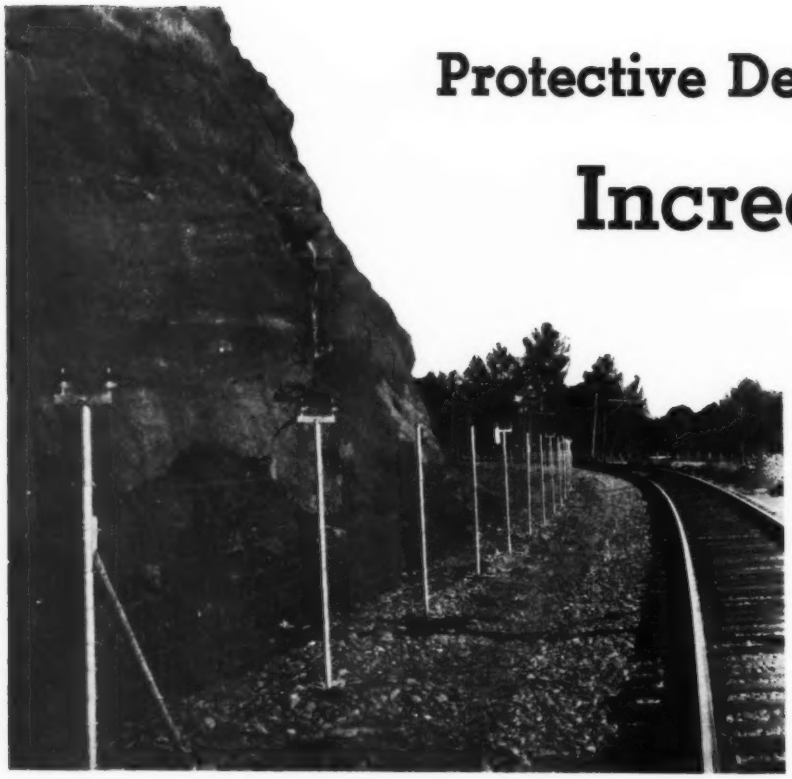
Search for New Materials Goes On

PROTECTION of overhead structures from the effects of locomotive blasts has always presented a problem to engineers. Many expedients have been tried and many materials have been applied in this service, in an endeavor to arrive at a design that will afford the maximum protection from the abrasive effect of the gases and the cinders as they are expelled from the stack, and from the corrosive action of the stack gases.

Among the many materials that have been utilized for the construction of blast plates, cast iron has probably been used most extensively, particularly for protecting concrete structures. If of adequate thickness and if applied properly, it should have a life equal to that of the structure, but when used in wide thin sections, cast iron exhibits a tendency to crack when subjected to vibration. To overcome this defect, malleable iron has been used in some instances, but less extensively than cast iron, because of its cost. Sheet lead has given excellent results, particularly on wooden structures, and has the advantage that it can be bent to fit in the field. More recently, test installations of creosoted-wood blast plates have been made and while they have not been completed, several years of service seem to indicate that this material is economical in first cost and can be used under relatively severe conditions.

Thus the search goes on for better, more economical, longer lived or more easily applied materials. This search is not confined to the single item that has been discussed, for it is merely typical of what is going on throughout the entire field of railway engineering and maintenance. Railway engineers have never been content to sit back and let nature take its course; they have always sought diligently for better materials and methods. At no time in railway history have they been more active in this respect than at present.

Protective Devices Increase Safety



Protection Fence Along a Rock Bluff Installed as Close to the Track as Practicable. The Fence Is Readily Removable for Ditching Operations

FOR a number of years the Southern Pacific has been making extensive use of automatic devices in connection with its automatic way-side signals to warn of washouts, slides and falling rocks, and of fires in tunnels and snow sheds and on certain bridges. A variety of these devices has been developed and installed to meet the special conditions encountered, and while most of the work in connection with their development and installation has been done under the direction of the signal department of the road, they are of such vital interest to the track and bridge and building forces in their constant effort to insure the integrity of their structures under all conditions, that they are described herewith.

Washout Detector

In 1921, water from a defective irrigation ditch flooded the right-of-way of the Southern Pacific near Lathrop, Cal. and caused damage to the fill under the track. As a result, an immediate attempt was made to devise a means of detecting similar flood or washout conditions at that location as well as at threatened locations along other rivers and streams.

The arrangement devised, which is supported on an 8-in. by 8-in. wood post, consists essentially of a ½-in. section of pipe, set vertically between two brackets attached to the post, which acts as a guide for a wood float. The supporting brackets are made of ½-in. by 1¾-in. wrought iron, bent outward from the post at an angle of 30 deg., with holes in their ends for ½-in. bolts which extend through the post. The float consists of a cylindrical section of cedar, 12 in. in diameter and 16 in. long, drilled through the center longitudinally, and fitted with a 1-in. brass tube 15 in. long, which slides over the guide pipe. The top of the hole in the float is covered with a disc 4 in. in diameter, made of ¼-in. brass plate, which is held in place by screws. The float cylinder is wrapped at both top and the bottom with copper wire to prevent splitting. The reason for using the wood block for a float, rather than an air-tight container made of sheet metal, was that the block will not develop leaks from corrosion or be punctured if struck by bullets shot by careless hunters.

Details of Operation

The wood block of the detector is set in place over the vertical guide pipe and is free to float upward as water rises around it. The upper bracket, which is of the same general construction as the lower one, is drilled to support an insulating block and a set of contacts similar to those used in a switch circuit controller, to which the line control circuit of the automatic signals is connected. A plunger ⅜ in. in diameter extends from the contacts down through the bracket to a point where, when the float is raised, it is pushed up to open the contacts, thereby causing the signals protecting the adjacent section of track to be set at their most restrictive aspect.

In the original design, a two-arm latch arrangement made of ⅜-in. round iron rod was hinged on the front of the top bracket and extended down to two hooks which normally rested against the front of the float block near the bottom. When the block floated up sufficiently to cause the contracts to open, these hooks slipped under the block and held it in the raised position. Thus, even after the water receded, the block would stay up and the contacts would remain open until reset by the signal maintainer after the track forces had had an opportunity to determine the extent of the damage caused by the high water. In the more recent design of flood detectors on the road, the hook latch has been eliminated, the latch-out feature being accomplished by a link with a dog actuated by a spring, so arranged that when the upper contact is raised, the dog is pulled under a fibre block on the contacts and keeps the circuit open until the maintainer resets the device.

Operates If Washed Out

The flood detector is housed in a wood case 18 in. square and 3 ft. high, equipped with a hinged door at the front which affords access to the working parts and connections when desired. Two rows of 1-in. holes are

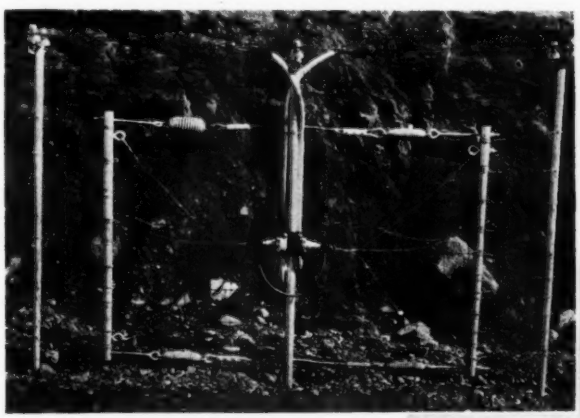
# of Operation

on the Southern Pacific

This article describes various types of circuit-controlling fences and other devices developed and employed on this road to warn of rock falls, slides, bridge failures and fires in tunnels and snow sheds. Experience has shown that at the points installed these devices have proved desirable, effective and fully justified from the standpoint of safety

provided around the lower section of the box to admit flooded water freely, these holes being covered with 14-mesh brass screen to keep out debris.

The first flood detector on the Southern Pacific was installed in 1922, and since that time 13 additional such installations have been made on the road. In the more recent installations, a local circuit, including a battery, a push button, a stick relay and one or two line relays, is used to effect control of the track signals. Also, as a part of the flood protection, two mercury contacts, mounted in the box, are so arranged that if the dirt or rock around the supporting post is washed away so that the detector device leans more than 20 deg. from the vertical, a contact is operated to open the circuit.



Left—Control Section of a Protection Fence Located Near the Track. Below—Protection at a Rock Bluff, with One Fence Along the Track and Two Located Higher Up

Fire Detector

Another type of detector developed and used at a number of points is designed to warn of fires in tunnels and snow sheds and on bridges of open-deck timber construction. This device consists essentially of No. 10 rubber-covered wire supported on porcelain knob insulators located approximately 6 ft. apart on bridges and 50 ft. apart in tunnels and snow sheds.

Midway between the insulators, regardless of their spacing, a lapped joint is provided, soldered with 68 per cent tin, which fuses at a relatively low temperature. When making such a joint, the insulation is first removed from 2¼ in. of the ends of the wires to be joined, and the bare wires are then tinned. Following this, resin flux is applied to the wires, which are then held tightly together by thread or light twine to permit the soldering operation. An electric iron is used to apply the solder in order to obtain a constant temperature throughout the work.

When soldering has been completed, the thread ties are removed and the joint is then washed with gasoline and painted with red glyptal lacquer No. 1201. Following this, the space at the joint caused by the removal of the insulation is filled with layers of Cambridge tape, each layer being painted with lacquer as applied. The theory of operation of this type of detector is that in the event of a fire the solder in the joints will melt, and the weight of the wire between insulators will cause the joint to separate, thereby opening the detector circuit and causing stop signal indications.

Where used on bridges, the wire is run on knob insulators fastened to the inside faces of the wood guard rails, the wire extending the full length of the bridge on one side and returning on the other. In tunnels, the wire is attached to the side walls at a height of about 12 ft., running the full length of the tunnel on one side and returning on the other, while in snow sheds, the wires are located as seems best

suited to the particular features of the shed construction. Both on bridges and in tunnels the fusable joints are staggered instead of being placed opposite, with the thought that this gives more thorough protection.

The wiring for the fire protection system consists of a series circuit operating a stick relay, which, in turn, opens the appropriate control circuit of the automatic block signal system. In some cases the device is cut in on the dispatcher's telephone circuit through an arrangement that indicates to the dispatcher that the device has functioned. This indication consists of a buzzing sound on the dispatcher's circuit, brought about by superimposing a buzzer through a repeater coil connected to the telephone line. The buzzer is so connected in the detector circuit that if the circuit functions it will ring for 30 seconds, a sufficient length of time to enable the dispatcher to note this condition, after which it cuts out, so as to cause minimum interference on the telephone circuit.

Fences Detect Rock Slides

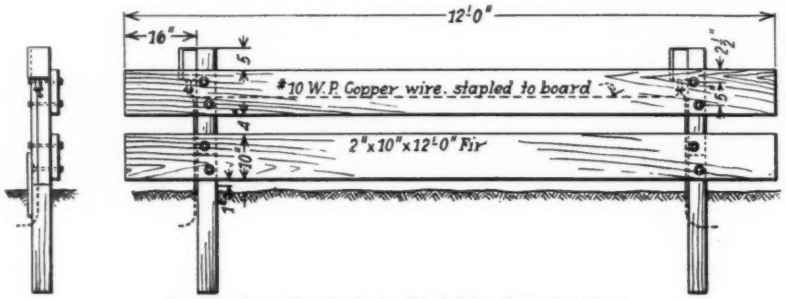
To afford protection against rock slides, several types of circuit-controlled fences have been installed on the Southern Pacific, each designed to afford the best practical protection against the possible hazards at a particular location. At locations where hillside slopes extend down close to the ballast line, and where loose rocks might roll on to the track, the protection fence is located as close to the track as practicable. Since fences of any kind in such a location would interfere with normal ditching operations at intervals, especially those carried out with track-mounted power ditchers, the type of fence designed for such locations is such that it can be removed temporarily while ditching is being done. The end posts are made of 2-in. galvanized iron pipe and the intermediate posts, which are usually located about 15 ft. apart, are made from second-hand 2-in. boiler tubes. All of the posts are given support in sections of 2½-in. pipe set in the ground below normal ditch level and surrounded by poured concrete footings. As set in position, the posts are keyed to their pipe footings by means of ⅝-in. bolts. By removing these bolts, the posts, and the fence, in part or as a whole, can be carried out of the ditch to permit ditching operations.

The height of the fence is varied to suit local requirements but as a general rule the fencing used is 55 in. high, with the vertical stays spaced 6 in. apart and the horizontal wires spaced according to the particular design of fencing being used. The bottom of the fencing is located 12 in. above the ground, in order to allow small rocks which would not damage the track to roll under it, thus reducing the number of unnecessary operations of the fence and possible delays to trains. As a further means of allowing small rocks to pass the fence without causing signal operations, it is planned in future installations to place the fencing upside down so that the wider vertical spacings will be at the bottom, rather than at the top. The fencing is fixed tightly to the end posts, but is free to move horizontally at the intermediate posts, being held loosely by ¼-in. by 3-in. cotter keys which are slipped over the strands of wire and then passed through 5/16-in. holes in the pipe posts.

The fences are made up in lengths of not more than 400 ft. and a controller station is located at the middle of each such unit. At the controller station the fence is broken, each half terminating in an upright member, usually made of a piece of wood about the size of a crossarm, although pipe has been used. These two loose ends of fence are joined near the top and bottom by lengths of stranded cable, fixed to the uprights by means of eyebolts and equipped each side of an intermediate controller post with a steel coil spring, 3 in. in diameter and 10 in. long. Thus, each tie, top and bottom, has two coil springs in it, which act to maintain tension in the lengths of fencing, while the eye bolts employed afford a means of making any sizable adjustment in the tautness of the fence as a whole.

In the electrical arrangement at the controller station the eye bolts at the top and bottom of each upright are connected by sections of twisted bell rope to a plug-type controller mounted on the intermediate controller post previously referred to. When a rock strikes any portion of the fence with enough force to deflect the fence sufficiently, one or both of the sections of bell rope are jerked and the controller is opened, thus setting the signals at stop until some designated employee inspects the fence and the track and then resets the device.

Two No. 10 weather-proof wires, forming a part of the electrical circuit, are run on insulators mounted on a 6-in. strap metal crossarm on the top of every third fence post. If a rock breaks one of these wires the circuit is opened, causing a restrictive signal indication.



Construction Details of the Mud Slide Detector Fence

In the Washout Detector, a Large Cylindrical Wood Block Is Used as the Float

Fences on Line Poles

In certain instances, where the base of a hill or rock slope is at or just beyond the edge of the right-of-way, the poles of existing pole lines have been used to support the rock fall protection fence. Here, where no ditching problem is involved, the fence is of permanent construction, and differs considerably from the movable type of fence already described.

In general, the permanent type of fence is made up in units up to 1,000 ft. in length, and, rather than employing standard fence wire, consists of individual strands of wire spaced 5⅜ in. apart, the breaking of any one of which opens the electrical circuit in the fence system and causes the adjacent track signals to go to their stop aspect. In this type of fence, the

existing line poles are not altered in any respect, but additional poles are set in the line so that the spacing between poles is not more than 50 ft. In all cases the poles are equipped with three anchors and guys to insure their remaining in a true vertical position.

For holding the fence strands, a 10-ft. standard wood crossarm, employed vertically, is used at each pole. At the end poles in each section of fence the crossarms are drilled at 5¾-in. spacing to take ½-in. eye bolts, to which the fence strands are connected through porcelain strain insulators. To prevent splitting the crossarms, they are strengthened by means of five ⅜-in. carriage bolts passed through them, located at the ends and at intermediate intervals of about 2 ft. The wire-supporing crossarms are secured to the end line poles by means of four ⅝-in. by 24-in. galvanized double-arming bolts, which extend through both the crossarms and the poles.

At each intermediate pole, whether it is a regular line pole or one of the additional poles installed, a single crossarm is mounted on the rear side of the pole, to which it is secured by means of double-arming bolts which hold it a distance of 6 in. from the pole. The sections of the bolts between the pole and the crossarm are covered with pieces of ¾-in. rubber hose to act as insulation. At these intermediate locations the fence wires are secured to the crossarm through porcelain knob insulators, spaced 5¾ in. apart vertically to correspond with the spacing of the eye-bolt wire connections at the ends of the fence section. The wire used in the fence is No. 9 galvanized iron wire with a weather-proofed coating. Each individual strand can be adjusted to length by tightening the nuts on the eye bolts at the extreme ends of the fence section, and the tautness of the assembly as a whole can be adjusted as necessary by tightening the nuts on the four double-arming bolts through each of the end poles.

No contactor controller device is used with this type of fence protection, the theory of operation being that a rock striking the fence, if of sufficient size to endanger train operation, will break one or more of the wires and thus open the circuit. As the fence is all on the pole line and is as well insulated from the ground as are the wires on the regular overhead pole line circuits, the line-control circuits are run through the two top wires of the fence. The remaining wires of the fence below are connected in a series circuit, which, in turn, is connected to a relay box located in a protected position on one of the line poles, on the side facing the track.

End of Fence Constructed on Line Poles

Tests made on this type of fence, as well as experience with actual installations, prove that a rock large enough to cause serious damage to the track or to present an obstruction to a train will easily break some of the wires in the fence, setting the track signals at stop. On the other hand, small rocks which would cause no hazard to train operation pass through the fence or roll under it, the lowest strand being 2 ft. above the ground. These facts were proved conclusively at a fence installation near Altamont, Cal., where highway construction being carried on about ¼ mile back from the track required a considerable amount of blasting. Here, where the protection fence is 160 ft. long, both large and small rocks were jarred loose from the hillside along the track, and while the smaller pieces passed the fence without obstruction, a number of the larger ones clearly demonstrated the effectiveness of the fence as a warning device.

Vertical Bluff Fences

At locations along high bluffs where rocks may fall almost vertically to a point near the tracks, the Southern Pacific has employed a type of protection which involves wires strung in a horizontal or near horizontal plane between crossarms at the top of a pole line. In these instances, the crossarms are set in daps in the sides of the poles at the angle best calculated to intercept falling rocks, and the wires are strung between them in much the same manner as in the case of the fixed vertical rock slide fences between regular line poles. In some instances two or more lines of poles may be located up the face of a bluff, and, where deemed desirable, vertical fences of the same general construction are attached to the poles to intercept rocks which may roll down the bluff and not be intercepted by the wires at the tops of the poles.

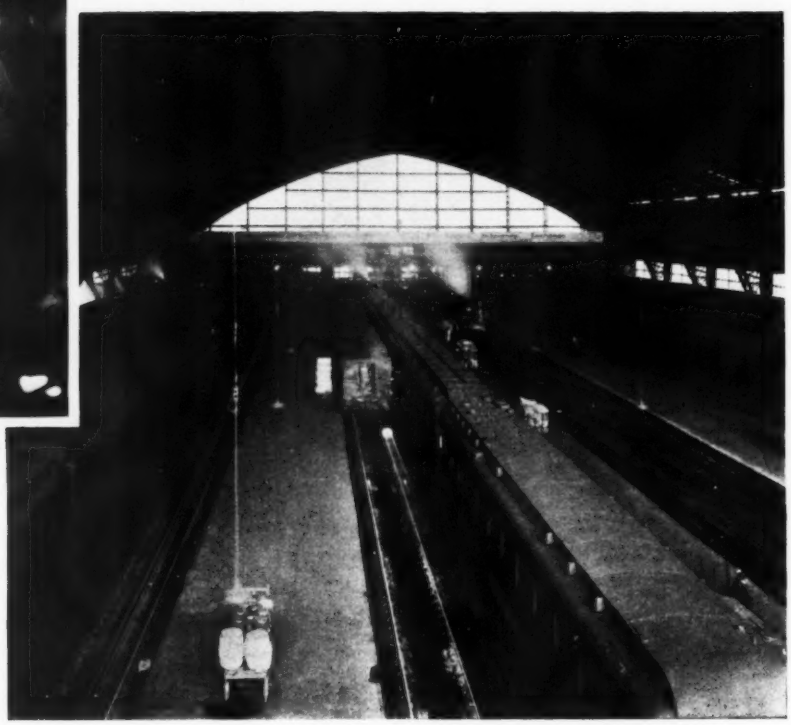
Mud Slide Detector

For use at one point where an embankment of clay located close to the tracks was subject to slides which frequently overflowed the tracks, warning fences of the types already described would have been inadequate, so the road developed a low board-type fence, so wired as to effect signal operation when tilted or pushed out of alinement. This fence is made up of 2-in. by 10-in. by 12-ft. fir planks fastened with ⅜-in. bolts to 4-in. by 4-in. fir uprights, 2 ft. 6 in. long, the planks being spaced 4 in. apart. The uprights of the fence sections are supported on and fixed to 4-in. by 4-in. creosoted fir posts set in solid ground, with their tops about 1 in. above the ground level. The connection between the fence uprights and the ground supports in each case is made by a piece of 1-in. redwood, 4 in. wide and 14 in. long, bolted in place on the side facing the track.

To effect the warning desired in this fence, the top of each upright is equipped with a cast iron box housing a set of terminals and two clips which hold a mercury-type contactor, suitably connected in the track signal circuit. The principle of operation of the fence is that if mud slides down the embankment and against the planks, the joints between the uprights and their post supports will break, allowing the fence to be pushed over. When this occurs at any section of the fence to the point where the fence inclines more than 20 deg. from the vertical, one or more of the mercury contacts open, causing the automatic signals at the ends of the protected section to be set at stop.

With the possibility that bridge piers in streams may settle out of proper alinement due to flood or other conditions, in spite of the best of engineering and construction employed, and may under such conditions pull the ends of bridge spans out of alinement, a system to check the occurrence of such conditions was devised by the

(Continued on page 381)



Below—This View in the Train Shed, Gives an Idea of the Nature of the Problem Involved in Repairing the Roof Trusses by Welding. Left—Welding in a New Cross Strut

Arc Welding

Used Effectively to Repair Train Shed

A portion of the structural frame of the Reading's "balloon" type train shed at its Philadelphia passenger terminal was recently subjected to extensive repairs, using the arc-welding process, a feature of the work being the use of large canvas canopies suspended below the repair operations as a protective measure. This article describes the welding work and also gives details regarding the manipulation of the protective canvas canopies.

BY renewing certain badly-corroded members and by reinforcing others through the use of the arc-welding process for fabrication purposes, the Reading recently completed an extensive repair project involving the strengthening of the arch trusses and other roof-supporting members in the "balloon" type train shed at its passenger terminal at Philadelphia, Pa. Not only does this project constitute a large-scale application of arc-welding in the repair of steel structures, but it is also of interest because of the protective measures that were employed to prevent sparks and other objects from falling to the track and platform level and also from striking the trolley wires that are provided in the train shed in connection with the Reading's electrified suburban service at Philadelphia. These measures consisted principally of the suspension of large canopies of fire-resistant canvas underneath the repair operations, this canvas being so supported from the arches that it could readily be taken down and moved forward as the work progressed.

Description of Shed

The principal supporting members in the Reading's train shed at Philadelphia consist of three-hinged riveted arches having a clear span of 259 ft. 8 in. between bearing pins and a clearance at the crown of nearly 80 ft. above the platform level. There are 20 such arches, arranged in pairs and spaced 50 ft. between center lines of adjacent pairs. The trusses in each double arch are placed 5 ft. apart and are connected by means of top and bottom laterals and struts and cross-frames. Roof-supporting members consist of purlins spanning between the double arches at every third panel point and jack rafters framing into the purlins, there being two lines of jack rafters in each bay.

Surmounting the train shed along its longitudinal center line is a clerestory serving as a skylight and ventilator frame. In addition, the roof structure embodies two lines of skylights on each side of the longitudinal center line, each of which occupies the space between two lines of purlins. These skylights, each of which is supported on three lines of steel subpurlins, are pitched on a somewhat

shallower angle with the horizontal than the roof proper, thus providing a vertical opening for ventilation along the lower edge of each skylight, this opening being protected by a timber apron on a metal frame.

All members in the double arches and their lateral systems, as well as in the purlins and jack rafters, consist largely of structural angles. In the arches, the top and bottom chords are comprised of a pair of angles, separated by a flange plate, and a cover plate, while the vertical posts and diagonals also consist of pairs of angles. In the top and bottom lateral systems, which are of the Pratt type with struts at each panel point and two-way diagonals in each panel, all members are comprised of single angles. This is also true with respect to the cross-frames, which are placed at all panel points where connections with purlins are made. Both the purlins and the jack rafters are of lattice construction, with the top and bottom chords and the web members consisting of angles in pairs.

Corrosion Damage

This train shed was built in 1892 and during its 47 years of service corrosive action due to smoke and gases had taken its toll of the metal in the structural members, particularly at the northerly end. This is the entering and leaving end of the shed for trains and, because the locomotives for departing trains remain spotted in the shed for longer periods than do incoming locomotives, the concentration of locomotive smoke and gases is greatest at the northerly end. Thus, the damage to the structural members was most extensive at this end, and it was in the five most northerly bays, therefore, that the repair work was carried out.

This work involved, in brief, the strengthening of the primary web diagonals and many of the verticals in the arches by the addition of new angles, and renewal of the secondary web diagonals and of many of the angles in the top and bottom lateral systems and in the cross-frames. Further, many of the verticals in the arch trusses at the purlin connections were also renewed, this operation comprising the most complicated phase of the work. In addition, the angles in the purlins and jack rafters were reinforced wherever necessary by welding new angles directly to the old members, and in some instances the jack rafters were renewed in their entirety.

Other work involved the removal of a section of the clerestory 85 ft. long and its replacement with a ventilator frame of much smaller dimensions, and also the removal of certain sections of the skylight frames on both sides of the clerestory. The areas formerly occupied by these skylights were roofed over, the construction consisting of timber sheathing supported on wood purlins and protected with a four-ply built-up roof coating.

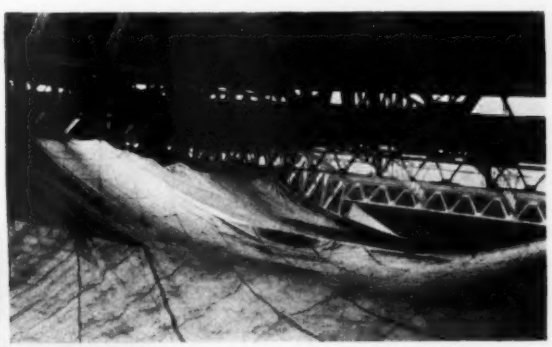
The actual work of making the repairs to the structural members in the train shed was, in general, carried out in accordance with recent practice in this respect. Wherever new members were to be welded to existing metal, all paint and other foreign matter was first removed from the latter with chipping hammers and all rivet heads on members to be removed were cleaned in the same manner. At some points the edges of the old angles in the purlins and jack rafters had been considerably reduced in thickness by corrosion, and occasionally it was necessary to cut such edges back with a torch in order to obtain an edge of sufficient thickness to permit the making of a fillet weld between the old and new angles.

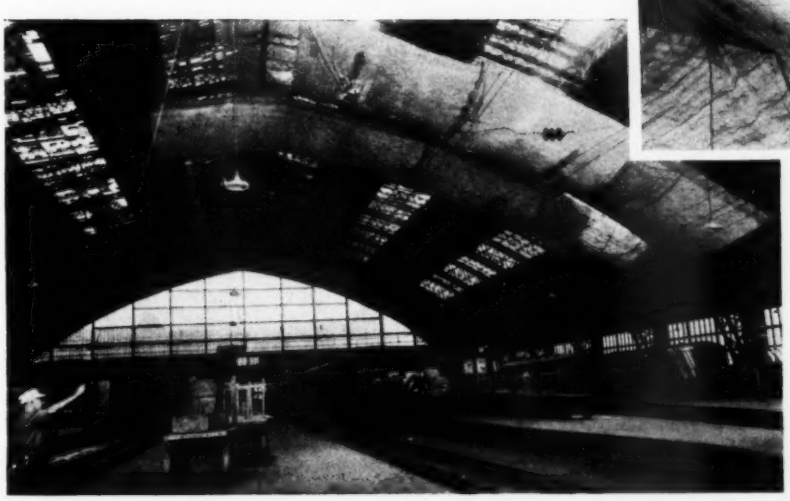
Details of Work

In renewing the top and bottom diagonal laterals of the double arches, the operation involved the removal of the old members by burning off the rivet heads with a torch and insertion of the new members by fillet-welding their ends to the flanges of the top and bottom chords. Originally one of the diagonals in each panel of the top and bottom lateral systems consisted of two angles fastened together by a splice plate at the intersection with the other diagonal. In the new laterals, however, both diagonals in each panel are one-piece angles, a leg of one of them being notched at the point of intersection to receive the other. Where they contact each other at their point of intersection, the two diagonals are fillet-welded together. The cross-frames and struts were renewed in much the same manner as the diagonal laterals of the double arches.

In making repairs involving the diagonals of the arches, the practice was, in the first step in each panel, to remove a sufficient amount of the secondary diagonal to permit application of the two new angles that were inserted to reinforce the primary diagonal. The latter angles were placed alongside the old angles and were fillet-welded at their ends to the flange plates of the top and bottom chords. After these angles had been placed, the angles comprising the secondary diagonal were replaced with the new angles, which involved the use of a splice plate at the intersection with the primary diagonal.

At panel points in the arch trusses where no purlin connections were in-





Below — Interior View of the Train Shed from the North, Showing the Arrangement of the Canvas Canopies. Right — Looking Down on one of the Canopies

volved, the existing posts were reinforced by the application of two additional angles. These angles were placed back-to-back on opposite sides of the flange plates in the top and bottom chords and were fillet-welded at their ends to the latter plates. About midway of their height, the parallel legs of the new angles are separated by a filler plate that was welded to the angles as well as to the existing post in the arch truss.

Changing Purlin Connections

As mentioned previously, the most complicated operation involved in the repair work was that entailed where vertical posts in the arches at purlin connections were renewed. Each of these posts was comprised of three vertical angles, to which were riveted the gusset plates comprising the end connections of the purlin. As the first step in renewing one of these verticals, the cross-frame at the particular panel point was removed. Next a new angle was placed alongside the post and welded at its end to the flange plates of the chords. With the vertical thus reinforced, the angles comprising it were removed and replaced one by one, the object being to maintain the integrity of the purlin connection throughout the operation. Where the construction called for a rigid connection between the truss and the purlin, rivet bolts were used for fastening the purlin gusset plates to the vertical post, but at points where allowance for expansion was made the purlin connections were made with bolts.

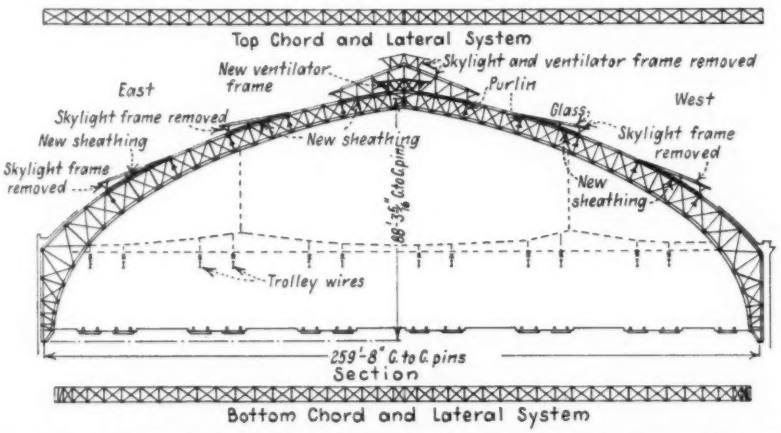
Cutting Through a Cross Strut Preparatory To Removing It

The repair operations described above were carried out first in that part of the shed west of its center line, beginning at the northerly end and working south. However, to avoid interference with the work of transferring materials to and from the roof in connection with the ventilator and skylight work, which function was performed in the northerly bay with the aid of a hoist, the repair operations were started in the second bay and on the third truss from the north end. The procedure in carrying out the work was to consider one bay and one pair of trusses as a unit, in which all work was completed before moving forward to the next unit.

The fact that the arches were arranged in pairs simplified the problem of providing platforms for the workmen while engaged on the trusses, as this could be done by laying planks between the flanges of the lower chords, 2-in. by 10-in. timbers being used for this purpose. These platforms, in which any sizable openings were covered with asbestos cloth, also served as a means of protecting the trolley wires, tracks and platforms against objects falling within the limits of the double arches. However, when renewing the bottom lateral systems of the trusses, it was necessary to work from suspended platforms designed both to provide working space and to stop falling objects.

Canvas Protection

In making repairs to the purlins and jack rafters, timber scaffolding supported on these members was used. In these areas, that is, in the bays between the double arches, it was necessary to provide other means for protecting the trolley wires and the track level, and this was accomplished by means of the large canopies of fire-resistant canvas mentioned at the outset. The practice was to protect the bays on each side of the double arch on which work was in progress at any given time; hence sufficient canvas was provided to cover the entire areas in two bays on one side of the center line of the shed.



Cross-Section Through the Train Shed, Showing Arrangement of the Top and Bottom Lateral Systems of the Double Arches

The canvas was furnished in sheets 40 ft. wide and 45 ft. long, three of these sheets being sufficient for each bay. Each sheet was reinforced with lines of ½-in. manila rope placed diagonally on 18-in. centers and sewed to the canvas. Also, a ½-in. rope was sewed to the canvas around the margin of each sheet, and metal rings were imbedded in the edges of the canvas at the ends of each of the reinforcing ropes. When in position, the sheets of canvas were supported by ropes passing through the rings and attached to the lower members of the arch trusses. Adjacent sheets of canvas were tied together with ropes passing through the rings, and a strip of asbestos cloth was laid over them along the line of contact.

To act as a supplementary means of support for the canvas sheets and to facilitate the work of rigging them up a system of ⅜-in. cables, placed longitudinally with the train shed, was provided at a level slightly below the lower members in the arch trusses. These cables were placed 16-ft. apart and were attached at their ends to the lower members of arches No. 1 and No. 7, counting from the north. When the canvas sheets were in position, they rested on these cables, which thereby assumed part of the load and also kept the sheets from sagging more than was desired. Intermediate support for the longitudinal cables was provided in the form of ½-in. transverse cables at each arch.

When the repair operations were

moved forward from one double arch to another, the canvas protection in the bay behind or north of the last completed double arch was moved forward to the bay just ahead or south of the arches on which work was about to begin. This meant that, instead of being moved from one bay to the next, the canvas was shifted two bays ahead, the intervening bay already being occupied by one set of the canvas.

In shifting the canvas forward to the next position, the sheet nearest the crown of the arches was loosened first, being folded back on itself and lowered down over the other sheets to the track level, the remaining sheets following in the same manner. In preparation for lifting it into the next position, each sheet was formed into a compact roll and placed in rope sling. It was then elevated with the aid of a hand winch to the desired position along one of the double arches, the rope slings serving to hold the sheet from falling while one edge was being fastened to the arch members. Next, six ½-in. ropes were fastened to the other edge of the sheet and carried across to the next double arch by workmen walking on the purlins. The rope slings were then loosened, allowing the sheet to fall down on the cable-supporting system, after which it was stretched across the bay by pulling on the six ropes and the other edge fastened to the opposite double arch. The work of tying adjacent sheets of the canvas together was accomplished by a workman supported in a boatswain's chair.

Repair operations on the bottom lateral systems of the trusses were carried on from a timber platform, 10 ft. by 12 ft. in dimensions, which was hung underneath the arches by means of cables at each corner. This platform was provided with side walls 8 in. high, and was protected by a covering of asbestos wall boards on the floor and the inside faces of the side walls. A similar but smaller platform (4 ft. by 4 ft. in dimensions) was used when working on connections between the purlins and trusses.

All work involved in making the repairs described in the foregoing was carried out under the general supervision of A. E. Owen, chief engineer of the Reading, and P. S. Baker, engineer of bridges. The welding work was done under contract by the Hallen Welding Service, Inc., while the railroad's bridge and building forces performed all work on the roof of the train shed involved in the removal of the skylight and ventilator frames. R. Seeman, bridge inspector, had direct supervision over the work for the railroad, while C. Ferry was the superintendent for the contractor.

Protective Devices On the Southern Pacific

(Continued from page 377)

road, which includes two types of controls. The device for checking the alinement of a pier consists essentially of a heavy pendulum suspended in a tripod mounted on one end of the pier, with the lower end of the pendulum connected to a circuit by relatively fragile wires which will break with any appreciable movement of the foundation supporting the pendulum arrangement. The pendulum itself consists of a 16-in. length of 90-lb. rail, which is suspended from the head of the tripod by means of a light angle iron which is welded to the section of rail at its lower end and attached to an eye bolt in the tripod head by means of a ring. The tripod itself, which is 4 ft. high, is made of light angle iron legs, the bottoms of which are bent and drilled to fit over anchor bolts in the top of the masonry.

Forming a part of the electrical arrangement, a standard A.A.R. terminal is attached to the bottom of the pendulum section of rail and another terminal is mounted on a block on the pier masonry in such a manner that the posts of the two terminals are in direct alinement vertically and 3¼ in. apart. In this position, the right-hand post on the pendulum terminal is connected to the right-hand post of the terminal fixed to the masonry by two strands of No. 19 enameled magnet wire, the length of which is such that if the pier moves more than ¾ in. with respect to the lower end of the pendulum, the wires will break, opening the electrical circuit through them.

Girder Alinement Checked

To keep a check on the alinement of girder spans, a terminal is mounted on the end of one of the girders at each end of the bridge, the posts of which are connected by two strands of No. 19 magnet wire to the corresponding posts of a terminal mounted directly opposite on the abutment masonry. In this case, if the girder span involved moves away from its normal position on the abutment more than 1 in. in excess of the maximum movement allowed for contraction, the wires will break, opening the electrical system of which they are a part. Obviously, also, this device warns of any appreciable lateral movement of the span relative to its normal position.

Wherever the various special warning devices described are in service on the Southern Pacific, the signals controlled are provided with a special marker to so inform enginemen. This is important because, under most conditions on the road, a train, after stopping at a signal displaying a most restrictive aspect, can proceed with caution, not exceeding 12 m.p.h., a permission which would not be entirely safe in territories where the signals are controlled by factors other than those clearly visible, such as the occupancy of the track by another train or an open switch.

Train Operation

Operating rules of the road require that when a train approaches a signal equipped with one of these special number plates and the signal indicates stop, a careful inspection must be made of the track, roadbed and other structures to insure their safety before the train can proceed past the signal, even under caution. To assist the train crew in checking the most probable sources of danger under such conditions, and thus avoid unnecessarily long train delays, the timetable not only lists all signals controlled by special protection devices, but also explains the type of protection involved in each case and its specific location—for example, Signal P-2390, Fire Protection Tunnel No. 6.

Thus, when stopped by such a special signal, the engineman, if he does not already know the special character of the protection involved, can quickly inform himself from his timetable. Having determined the probable source of danger, he can then proceed according to the rules, but must stop short of the point of hazard. The conductor and other members of the train crew then co-operate in checking the extent of the damage, if any, and, if necessary, telephone for the help of the track forces and the signal maintainer. If the conductor can see that a rock has operated one of the protection fences and has stopped short of the track or has rolled over without causing damage, the train may proceed under caution, but the dispatcher must be notified when the train arrives at the first open office so that the maintainer can be called to reset the fence controller, thus clearing the signals.

A record is kept to show when each signal protection device is operated, and also the character of the hazard involved and the number of trains affected. Such records to date indicate that in many instances conditions were sufficiently hazardous to warrant the train delays incurred, in view of which, the expense of installing and maintaining the various protection systems at these points is considered to be fully justified.

"Shims of the Correct Thickness for the Temperature of the Rail Should Be Used and the Rail Should Be Set in Tight Against Them, but Without a Bump"

Things to Think About When Laying Rail*

By J. B. MARTIN
General Inspector of Track,
New York Central, Cleveland, Ohio

On the premise that much of the life in rail is determined by the care with which it is laid and by the attention given to it during the first six months under traffic, the author of this paper stresses the importance of many details in the handling, laying and conditioning of rail, often overlooked in attempts at speed records or excessive production. He also cautions against a number of common practices which he says are highly detrimental to the rail, increasing the cost of its maintenance and reducing its service life

THE successful and economical maintenance of good track begins with the laying of the rail. If the rail is not laid correctly and then properly conditioned, no amount of subsequent attention and labor will maintain it satisfactorily and insure its maximum service life.

Great emphasis has been placed in the past on the speed of laying rail and on securing large production per day. These factors are important, as we are all interested in carrying out our work at the lowest possible cost, but there is danger in speed if large production is secured at the expense of quality work, and the apparent low cost secured will prove to be poor economy when increased maintenance costs and reduced rail life are taken into consideration. The primary consideration of the track forces in laying rail should be quality work, combined with the lowest cost possible through the use of carefully organized forces and suitable equipment.

Care in Unloading

Rail should be laid as early in the season as weather conditions will permit so that all of the refinements necessary for its protection and long service life can be well taken care of before the winter season sets in. The care of rail starts when it is unloaded. It should not be dropped with force, or its ends allowed to strike the ground. When being unloaded, it should be in balance and set on the ground with an even bearing to prevent any chance of its becoming bent.

Lubricating Joints

Equally important in the laying of rail is the care of the rail joints. The splice bars to be applied should be lubricated with either a graphite grease applied with a brush, or with the new type lubricating packing which is now available in cartons. In any case, the lubricant should be of a type that will retard corrosion and permit freedom of movement of the rail within the bars with temperature changes.

A committee on the New York Central that made a study of joints in connection with laying rail found that the practice of oiling the rail fishing areas and hanging the splice bars on the rail in advance of the rail laying work was detrimental. It found that pre-oiling of the rail fishing permitted dirt, cinders, dust and shavings from the adzing machines to foul the fishing areas and thereby defeat the main purpose of the oiling—freedom of movement of the rail ends in the bars. As a result, it recommended delaying the oiling of the rail fishing until immediately after the rail has been set in place. According to its recommendations, the bars should be laid on the ties directly opposite the rail ends, fishing side up, immediately behind the outfit setting in the new rail. Then, following the cleaning of the fishing surfaces of the rail by wire brushing, and also cleaning of the fishing surfaces of the bars, as necessary, the lubricant should be applied to both the rail and the bars. When using a liquid lubricant, it recommended uniform application, starting on the underside of the rail head and continuing down the web, and then finally out on the flanges. This method, in combination with the coating of the entire inside area of the bars, is most satisfactory and permits a better fit of the bars than can be expected under less careful methods.

Problem of Corrosion

While I know of no satisfactory method of closing the openings between the rail and bars at their ends, numerous experiments have been and are being made to accomplish this in the interest of preventing excessive

*From a paper presented before the Maintenance of Way Club of Chicago.

corrosion of the rail ends, and the subject is worthy of still further study and experiment. Very often, due to brine and cinders being drawn in back of the bars by the suction created by moving trains, serious corrosion of the bars and of the rail within the limits of the bars has resulted. As a consequence, it has been necessary to renew a considerable mileage of such rail—rail which was otherwise in good condition and would have given several years additional service life. If one end of the joint assembly could be kept closed effectively at all times to prevent the accumulation of brine and cinders behind the bars, this trouble with rail end corrosion would probably be eliminated.

Assembling the Joints

The proper application of joint bars is most important to secure proper fit of the bars and to avoid cocking of the joints. If the bars are not applied correctly, or for other reasons do not fit properly, they will not support the joint properly and wear of both the bars and the rail will be accelerated. Unfortunately, the application of bars is often made in a clumsy manner and bolts not properly centered are driven in with a maul. "U"-shaped rods placed through the two center holes and pins put through the end holes of six-hole bars will be found very satisfactory for bringing the bars into proper position, with the holes in alinement. Splice clamps will also be found useful in placing the bars correctly without cocking.

A toggle clamp extending over the head of the rail was used formerly for a long time to position the bars correctly during their application, but it was found that while this device brought one bar into correct position, it had a tendency to cock the other bar. A device that clamps the lower part of the bar with a pin through a bolt hole overcomes this trouble. A good device of this character is an L-shaped pin placed through the bolt hole and drawn up with a 36-in. leverage bar with a claw-shaped end. The pin draws in the bottom of one splice while the heel of the leverage bar draws in the heel of the other. Such a device can be used to advantage with a hinged spacer block such as is used on the Pennsylvania. This block is placed at the leaving end of the bar, while a man with a ratchet wrench tightens up the first bolt in the end of the receiving rail. The block is withdrawn just before the bolt is run up tight.

Cocked bars resulting from faulty application are serious in that they cause frozen joints and accelerated wear of both the bars and the rail. In fact, it might be well to consider whether many cracked and broken bars are not the result of improper application and frozen joints.

Bolt Tightening

It is an old rule on many roads that all joints must be fully bolted and that the bolts must be kept tight at all times. While the first part of this rule is generally obeyed, I am afraid that the latter is often overlooked because it is not uncommon to observe many bolts that are loose. No joint will function properly if its bolts are loose. In fact, loose bolts are probably the greatest cause of joint and rail end damage, and with them it is impossible to maintain good surface at joints.

The development of the power wrench was a step forward in the direction of better bolt and joint conditions, but this machine must be used with judgment and discretion. I am certain that many bolts have been overtightened with power wrenches, and that some have been stretched far beyond their elastic limit. These conditions are possibly as detrimental as loose bolts, or more so, and they cannot be detected as readily. Unquestionably, overtight bolts comprise one of the principal causes of frozen joints.

I believe we will all agree that the power wrench should be used for bolt tightening, both in out-of-face work and routine maintenance. The question is as to how it should be used. Investigation made on our road indicated that only the high-speed drive should be used for running up nuts, leaving the final tightening to a man with a 36-in. hand wrench. Owing to varying calibration of the machine, the use of the low speed appeared questionable.

Most roads have specified times for tightening bolts, and this is a good practice. I am afraid, however, that in many cases the times have been set with primary consideration to when the men could best be spared from other work, and with not enough importance attached to the bolt conditions themselves, and also to the further fact that if loose bolts develop between tightening periods, they are neglected. This cannot be done without damage to the joints. The bolts should be tightened whenever they become loose, and the work of retightening them should be done by experienced men, with the aim of maintaining correct and uniform tension in each bolt at all times.

The Rail End Gap

Another factor of importance in maintaining good joint condition is that of maintaining correct expansion gaps between rail ends. I realize that under present conditions it is impossible to maintain this condition, but it is a fact that the situation can be improved greatly with careful and exact work.

In the first place, the rail should be laid with the proper expansion allowance. To do this, the temperature of the rail should be taken with an accurate thermometer at frequent intervals during the rail laying work and the thickness of the shims used should be changed in accordance with any temperature changes in the rail. Proper shims should be used. They should be exact in size—that is, if an ⅛-in. shim is called for, it should be ⅛ in. thick throughout. The use of pieces of board or keg staves should not be tolerated. A sufficient number of each size of shim required should be on the job at all times. The practice of doubling up shims is not advisable. Some roads are using a fibre shim, and I believe that a thorough trial of this shim should be made.

In allowing for expansion, no devi-

"Power Wrenches Are a Step Toward Better Bolt and General Joint Conditions, but They Must Be Used With Judgment and Discretion"

ation should be permitted from the expansion table. If the gap provided is too wide, it will result in excessively open joints in the winter, which will cause batter of the rail ends and possibly shearing of the bolts. The bolt holes allow only 5/16 in. for rail movement, and if the major part of this is taken advantage of in allowing for rail expansion during the summer, there will be too little left for the contraction which will take place during the winter. On the other hand, if too little gap is provided, it will result in tight joints and kinky alinement in the summer, and, eventually, chipped rail ends.

When laying rail, care should be taken that the expansion gap provided is not disturbed. The rail should be set in tight to the last shim, but without a bump. Bumping the rail is the cause of much disturbed expansion. Likewise, after the rail is laid, careful attention should be given to preserving even expansion. It certainly is not profitable to go to the trouble and expense of providing correct expansion only to lose it the same day by careless practices.

Bolting and spiking should follow closely the setting in of the new rail, and tightening of the bolts should be done before they become loose enough to disturb the expansion. Rail anchors should be applied immediately after the rail is laid, and preferably before a train is permitted to pass over it. A sufficient number of anchors should be applied to control rail movement in both directions. Do not err by applying too few.

Good Ties Necessary

The rail should have bearing on all ties, and to help prevent its movement, and thus damage to it, all loose ties should be tamped up immediately after the rail is laid, either by hand or by machine, to afford it firm bearing on each tie until such time as the out-of-face tie spacing and track surfacing program can be carried out. This spotting up of loose ties should in no case take the place of giving the rail a general surface, which latter work should follow the rail laying as closely as possible.

"Rail Anchors Should Be Applied Immediately After the Rail Is Laid"

Ballast Should Be Good

Track cannot be maintained properly on insufficient or poor ballast. Where the ballast is insufficient or dirty, the joint ties will churn and the joint bars and rail ends will be damaged. Where new rail is programmed, ballast cleaning or reballasting should be carried out a year in advance of the rail laying work in order to avoid the necessity of making a high lift of the new rail. Where a high lift is made, there is bound to be uneven settlement for some time, with danger of damage to the new rail. The old rail should be made to take this punishment and the new rail should be raised only enough to permit easy spacing of the ties and the establishment of a good running surface.

I do not think it wise or economical to defer the renewal of ties with the thought of making extra heavy renewals under new rail. In my opinion, when ties have deteriorated to the point where they are no longer useful, they should be renewed, and heavy renewals under new rail, or under any rail, should be avoided. Heavy renewals will disturb the ballast bed and cause uneven settlement of the track for some time. On the other hand, if the ties are in good condition where new rail is to be laid, less adzing is required and the ties will consequently furnish a more uniformly solid bearing surface for the rail.

It may be argued that all of the refinements mentioned will add to the cost of laying rail. I seriously question this. A close study of the average organization employed in laying rail will show that there is sufficient slack to take care of these additional refinements without slowing up the work and without additional expense for labor. Using the proper number of men in the organization, with each unit properly spaced to prevent interference with the others and suitably equipped with power tools and equipment, it will be found that the highest grade of workmanship can be accomplished in all operations, both efficiently and economically.

Initial Care Worth Most

Even if it should mean some slight increase in the cost of laying the rail, it will be found that the added cost will be more than repaid in better quality work and increased life of the rail. This should be evident because it is a generally recognized fact that the life of rail is determined largely by the care exercised in laying it and by the attention which it receives during the first six months of its service life.

A mile of heavy-section rail with its fittings, plus the labor and work-train expense involved in setting it in place, requires an out-of-pocket expenditure of $17,000, or more in many cases. Assuming that this rail has a normal life of 10 years when laid according to present practices, its annual cost will be at least $1,700. On the other hand, if by greater care and attention to details in laying the rail, its life could be increased to 12 years, it is evident that the annual cost involved would be in the neighborhood of only $1,417, a saving of approximately $283 per mile annually. Certainly, this saving becomes impressive when applied to the large mileage of rail which is laid each year.

"The Care of Rail Starts When It Is Unloaded — It Should Not Be Dropped With Force or Its Ends Allowed to Strike the Ground"

A Foreman Must Be a Leader, Not Necessarily a Working Man. His Principal Duty Is to See That the Men Perform the Work Promptly and Properly

The Training of Foremen—

As Foremen See It

Abstracted from a report presented before the Association of Maintenance of Way Foremen of the Chicago, Cleveland, Cincinnati & St. Louis by a committee, of which C. R. Taggart, bridge and building foreman at Indianapolis, Ind., was chairman

THE foremen of today are the trainers of the mechanics, the foremen and possibly the supervisors of the future. With that idea in mind, let us start by hiring men who are capable of becoming foremen. The selecting of employees to fill vacancies in the gangs is generally done by the foreman, sometimes by the supervisor and occasionally by a labor agency, but too often it cannot be said that the men are really selected. A man who is selected to become an employee should measure up to certain qualifications and the foreman should have these qualifications in mind when selecting a new man.

You cannot give too much thought or study to the selecting of men for your gang for, after all, your gang is going to be no more efficient than the men you bring into it. In this connection it is pertinent to recall a statement made several years ago by Elmer T. Howson that "when we have a vacancy we are apt to look for the first fellow who is handy and he goes into the gang. He sticks and acquires seniority rights and we then have him on our hands. The way to get an efficient force is to select men for even the less important positions with the idea that these men are going to make foremen."

Those foremen who follow a careful system of selecting employees will develop many potential foremen after a reasonable length of time and some of these men may be capable of advancement to positions higher than foremen. Develop your men and push them along as far as they are capable of going, even though you may lose some good men from your gang. After all, is not that the feeling that you desire your supervisor to have toward you? When your supervisor asks you if you have a man who is capable of doing a certain job, do not hesitate to recommend one who deserves promotion.

Capable Men Should Be Promoted

As a man in the gang becomes more proficient in his duties, he should be advanced to the higher grades in the gang as such positions open until he reaches the top. When there are odd jobs that require that a few men be detached from the gang, he should be put in charge of these men and so given opportunity to acquire confidence in himself and ability to handle men. When a man has reached this stage, he has become a gang leader and should be so recognized by the other men. It is not always the best mechanic or the man who actually does a job better who makes the best gang leader or foreman, but the man who has a general knowledge of all requirements, knows how good work is done and how much work each man should accomplish, will make a good foreman.

Before one of your men is appointed a foreman, teach him that the foreman is the key man in the gang, even more so than 15 or 20 years ago, because more is required of a foreman now. More reports are required and greater stress is laid on efficiency and on the conservation of material. The foreman is the man who carries out the desires of the supervisor. He is the man who can spend money intelligently or wastefully.

A foreman has to be a leader, not necessarily a working man. It has been said by men of authority that a foreman who works along with his men continually usually has half of the men watching the others work. A foreman accomplishes more if he moves about among his gang after laying out the work and sees to it that they perform the work promptly and properly.

It is well to teach the men who

work for you to apply the proper amount of energy to their work but also to let them know how necessary it is to predetermine the method of procedure. Men have no respect for a foreman if he goes at things in a nervous manner, never knowing just what to do next, causing unnecessary work to be done with nothing accomplished. A man who uses his energy properly to direct workers will have his men striving to do their best for they then know that the energy which they themselves are expending is not being wasted and they are actually accomplishing results in an effective manner. Men have confidence in this type of leader and will respect his judgment. They, as well as the company, will profit by having this type of man as their leader because they naturally will be imbued by his spirit for accomplishing results and be more efficient.

Personal Factors

Teach the men to be good managers of their personal affairs. If a man cannot properly handle his own affairs, but spends more than he earns or does not spend his own money profitably, he should not be selected to spend money in labor and materials for his company. Tell your men that to get along in the world a man should first learn not to be extravagant at home. Tell him to spend his money according to his earnings and stay out of debt. Worry over debt does not leave a man's mind clear for his work and is often responsible for serious injury. Likewise, advise your men not to bring their domestic troubles to work with them, as the same serious results can be expected.

There is always a way of letting your men know the importance of a neat personal appearance. If a man can be taught always to be clean and neat in appearance, he will take more pains in doing his work so that it will have that same neat, finished appearance.

Reliability is another very valuable asset. It is a characteristic which a man alone can develop to the point where his superior officers will recognize it. No one can take it from him but it is very easily lost.

Many men who are willing workers are not safe. They may be careless or indifferent and no amount of caution on the part of the foreman seems to have any effect on them. Such men should not be put to work because if they are, accidents to themselves or others invariably result through their carelessness.

On the modern railroad today a foreman or his men are severely handicapped if they do not have a good education. Because one did not get a high school or college education does not mean that he can not improve himself. We all have opportunity to read articles pertaining to our work and observe the methods set up by railroad standards. The

Foremen Must Plan the Method of Procedure to Carry Out the Work in a Safe and Efficient Manner

men may ask the foreman and the foreman can always inquire of the supervisor if in doubt as to the proper method of doing any work.

Education Helps

It is well for all employees to remember that an education helps one to do his work with more ease; and also that some of the best railroad men today had only a limited education when they started to work for their company, but that by applying themselves, being observing, resourceful, and willing to learn, they have succeeded in making the grade, while the fellow who thought things would come to him without working for it was left far behind. Do not allow your men to depend on seniority to get them promotion or even hold their present jobs for them.

Give each of your men credit for knowing something. Let them know too that they are supposed to have some initiative and permit them to use it. Teach your men that when they obtain authority over other men they should be fair with them, for dissension is sure to arise if all men are not treated fairly and alike.

The thought that is uppermost in any foreman's mind is to get his work done but his duties also include many other things. If you have developed a man to the point where you think he may have an opportunity to try out as a foreman, it is your duty to show him how to make out the daily labor, material, work train and the numerous other reports that are a part of your duties and are just as essential as the actual work on the different jobs. Advise them also that thought must be given by the foreman to the distribution of time and material.

Also, during the time that a man is working for you, do not fail to instruct him on the general rules, tell him of the safety requirements and instruct him in the care of tools, the conservation of material and the planning of work.

Initiative Is Essential

All of you foremen know that you are alone on the job the greater part of the time; therefore a prospective foreman must have initiative, be dependable and be capable of assuming responsibility in any emergency without the advantage of advice from a higher officer. If a prospective foreman has these qualities, they will develop during his work as a gang leader. Good gang leaders, of course, are the best source from which to select assistant foremen, relief foremen, etc., for short periods.

Teach your men that slip-shod work will not be tolerated. You cannot develop men to do particular work if you do not insist that even the smallest job be done neatly and in the proper manner. It is necessary that a foreman display interest in his work as his attitude has a great influence on his men.

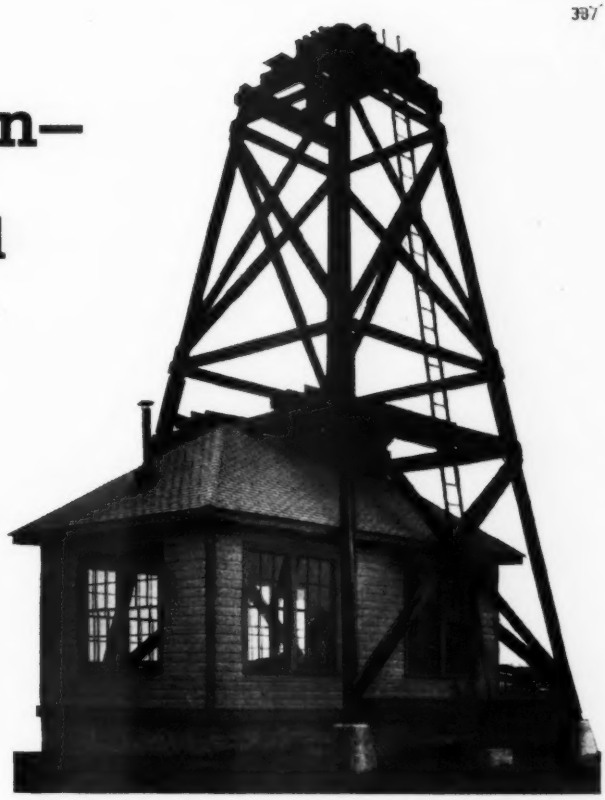
Stress the importance of a gang leader or foreman being able to read blueprints. You may not have a blueprint to read on your present job, but the duties of a foreman or supervisor today require that knowledge. Blueprint reading is simple and does not require a great amount of practice; however, the time and thought given to it will be of great value when that experience is required.

Let all your men know that it is their duty to treat the patrons of the company fairly and considerately; that the public judges our company by the company's representatives with whom they come in contact. Our department receives complaints from industries that must be given consideration. In training men to become foremen, they should be taught to handle these complaints diplomatically and assist our company in keeping the business that rightfully belongs to us by taking care of the small needed repairs of which the patron complains.

Well Rejuvenation—

Fitting the Method To the Situation

Frequently the production of water from wells falls off and it becomes necessary to take steps to increase the output. To accomplish this end various methods are in use, as described in this abstract of a report presented at the convention of the American Railway Engineering Association by a subcommittee of the Committee on Water Service, Fire Protection and Sanitation of which John P. Hanley, water service inspector on the Illinois Central, Chicago, was chairman



The Output of Wells Can Frequently Be Increased Sustantially by Cleaning, Using One of a Number of Methods

THE methods used for rejuvenating wells vary according to the circumstances or the particular condition of the well to be improved, and there may be variations in the application of a particular method in different kinds of water-bearing formations and under different local conditions. Before the reconditioning of a well is undertaken, it should be studied carefully, attention being given to such matters as the age of the well, the character of the pumping equipment and of the well screen, and the chemical content of the water.

Methods of Rejuvenation

In redeveloping wells it is generally necessary to use some form of agitation. Certain wells may be improved by starting and stopping the pump frequently for a period of time, and even when other methods are used pump agitation is useful in cleaning the screen and breaking up any incrustation that may be present. A simple and effective means of cleaning and agitating wells is provided by a plunger made of wood or other suitable material, having a slightly smaller diameter than the well screen. The rapid raising and lowering of this plunger in the screen from top to bottom breaks up and washes out the incrustation unless it is unusually tenacious or is firmly lodged in the screen openings.

If the latter condition is present, the screen may be filled with hydrochloric acid, dry ice or hypochlorite solution, which will usually remove the various types of incrustation encountered. If it should become necessary to use such materials, the chemical analysis of the water, the composition of the incrustation, and the nature of the metal used in the screen should be studied in order to select the most efficient chemical, subject to the consideration that it must not be of a type that will damage the well screen or equipment.

Low-pressure steam delivered into the screen by a pipe line has been used by some railways, but care should be taken to guard against eruptions of boiling water that may rise to the top of the well when this method is used without suitable protection. The use of an air lift, where sufficient water depth for adequate submergence is available, is beneficial in cleaning debris from the bottoms of wells. Air agitation also creates a surging action that tends to loosen incrustation and raise the pieces to the surface. In cases where the particles are too large or heavy to be removed by a jet or wash line, a bailing bucket with a check valve in the bottom may be used and the heavy material removed by hoisting.

In the event that none of the foregoing methods proves satisfactory the screen should be removed, cleaned and reset. This operation requires skilled wellmen and is generally more expensive than reconditioning screens without removing them.

Practices on the I. C.

The Illinois Central reconditions from six to nine wells per year to improve production. Two artesian wells at Gwin, Miss., both 400 ft. deep in a sand formation, one installed in 1912 and the other in 1915, were improved by light swabbing and the application of the air lift. As a result of the measures taken, the production of these wells was increased 15 to 25 per cent. Deep flowing wells are easily damaged and require careful handling and hence heavy agitation is not desirable.

Four flowing wells at Gilman, Ill., 100 ft. deep and 30 years old, require rejuvenation at intervals of 4 to 5 years. Also, there are three wells at Palestine, Ill., that must be reconditioned periodically although these wells do not flow. At these locations iron oxide paste and slime collect in-

side and outside of the screens and the sand and gravel become packed to such an extent that water production is seriously reduced. In both cases, the extracting, cleaning and resetting of the well screens have been accompanied by increases in production of 30 to 40 per cent.

Another well on the Illinois Central at Pesotum, Ill., which was installed in 1919, is 258 ft. deep and has a screen 13 in. in diameter and 65 ft. long. In 1928, 800 gal. of hydrochloric acid was introduced into the screen of this well by means of a 1½-in. iron pipe. This resulted in the cleaning of the screen and sand formation to such an extent that the production was increased from 42 to 125 gal. per min. The acid cost was $160, and $40 covered the cost of labor. In 1933 and again in 1937, the well was rejuvenated by swabbing the inside of the screen with a wooden plunger and by pumping and bailing. As a result of these measures, which involved a labor cost of about $90 for each cleaning, the production was increased from 50 to 100 g.p.m. At Millington, Tenn., six 10-in. well screens were extracted, cleaned and reset in 1939, with the result that the combined production was increased from 5,000 to 17,000 gal. per hour. The cleaning of these wells involved a labor cost of $720.

In 1931, the Atchison, Topeka & Santa Fe constructed a 24-in. well, 40 ft. deep, at Enid, Okla., in which the casing and screen were made of concrete. A four-inch iron pipe containing slots was installed on the outside of the well casing in such a manner that the slots in this pipe were opposite those in the well screen, and a surface connection was provided for wash water. In 1938, after the production of the well had decreased from 54 to 10 g.p.m., the fine sand blocking the screen was removed by introducing water outside of the screen, which was pumped in from a tank car. As a result, the production of the well increased to 40 g.p.m.

Use of Dry Ice

A well-drilling company reports a case at Oxford, Miss., involving a gravel-walled well with an iron screen that was installed in 1912. In 1932, the screen became clogged, with the result that the capacity of the well decreased from 500 to 150 g.p.m. The static water level in the well was 80 ft., while the pumping level receded to 115 ft. As a corrective measure, the turbine pump was removed from the well and 500 lb. of dry ice was inserted, with the result that the water became so agitated that it rose to the surface of the ground. When the pump had been replaced, it was found that the production of the well had been increased to 400 g.p.m.

Hydrochloric acid was used successfully in rejuvenating a well on the Northern Pacific at its terminal at Jamestown, N.D., where the water consumption is 600,000 gal. per day. At this location the water is obtained from a 12-in. well, 100 ft. deep, in a gravel formation. The screen is 15 ft. long. When the well was drilled, the static level was 11 ft. below the surface and the pumping level, with the well producing 613 g.p.m., was 21 ft. In July, 1938, it was found

Blowing Out a Well After Cleaning Operations to Increase Its Flow

that the production had decreased to 346 g.p.m., and that the pumping level of the water had receded to 34 ft.

This well was rejuvenated by introducing 100 gal. of hydrochloric acid at the bottom of the well screen through a 1¼-in. iron pipe, while a similar volume of water was pumped from the top of the well by a small hand pump. The acid caused violent agitation in the well and, after an interval of 20 hr., the screen was also agitated by air. After the pump had been replaced, the production tested 505 g.p.m. The cost of the work at this well included $22.68 for acid and $50 for labor. It was estimated that the renewal of the well screen at this location would have cost $500.

At Sterling, Ohio, the Erie rejuvenated a 10-in. well, 100 ft. deep, by removing the screen and breaking up the packed formation with a drilling tool and then bailing out the fragments. After the screen had been reset and the formation washed, it was found that the output had increased from 250 to 500 g.p.m., with a draw-down of 9 ft. as compared with 30 ft. previously.

In another case on the Erie, dry ice was used to restore a gravel-walled well at Crown Point, Ind. The production of this well had decreased to such an extent that only 15 sec. of pumping was required to exhaust the supply of water in the well, after which the pump would idle for 35 sec. During the 15-sec. intervals, the production was 110 g.p.m. In February, 1939, 96 gal. of 18-per cent muriatic acid were applied to the well, but since this did not give satisfactory results, 300 lb. of dry ice were dropped into the well in pieces of considerable size in April of the same year. Violent agitation for a two-hour period followed this treatment, after which the pump was replaced in the well and a test production of 255 g.p.m. was obtained, which was secured without a break in the supply of water to the pump.

M. P. Uses Dynamite Caps

On the Missouri Pacific, wells are restored by means of electric detonators or dynamite caps. This method has been used successfully to treat wells in sand formations ranging from 50 to 125 ft. in depth. The usual practice is to use a duplex wire, 14 to 18 gage in size and about 10 to 15 ft. longer than the depth of the well. Five caps about one foot apart are fastened to the wire at the bottom end, and are lowered to the bottom of the well and exploded with either two dry-cell batteries or a standard blasting machine. The wire is then removed from the well, the exploded caps and their wires are detached and five more caps are attached in the same manner.

Again the caps are lowered into the well, this time being stopped at about the point where the top cap was exploded previously. This procedure is repeated until the entire length of the strainer has been exposed to the treatment. To obtain the desired results it may be necessary in some cases to repeat the entire process, depending on the formation and condition of the well. Afterward the pump is reset and operated to remove mud and incrustation from the well.

The materials that are used in applying this treatment can usually be obtained from the company stores at a nominal cost. Following the application of the treatment to two 8-in. wells, 150 to 175 ft. in depth, at Wynne, Ark., the delivery was increased from less than 75 g.p.m. to more than 150 g.p.m. Similar results have been obtained at other locations. In cases where the strainer is in poor condition, it is advisable to put a heavy wire screen or netting around the caps to hold them in the center of the screen, thereby lessening the possibility of damage.

The foregoing comments deal with wells in gravel and unconsolidated

formations. Wells in rock should also be given consideration as such wells are numerous and important in sections of the country where water is obtained from limestone, St. Peters, Potsdam and other rock formations. The St. Peters and Potsdam formations are the deepest and usually contain the most abundant supplies of water. Some formations of lime rock produce limited supplies at much lesser depths from fissures and through seepage in favorable sections. If a well in rock is properly encased through the caving formations and the initial supply is sufficient, it will usually require less reconditioning than wells in unconsolidated formations.

When installing a rock well, the railroad should deal with a reputable driller who is experienced in rock drilling and is familiar with the formations in the locality. The geology of the formation, the approximate depth of the water and its probable analysis are factors that should be considered in advance. The top section of the well should have a diameter sufficient to permit a progressive decrease in the size of the casing where the use of the latter is necessary through caving formations, and to allow the installation of a bottom section sufficiently large to obtain the desired production. The casing should be of a character that will have the necessary structural qualities commensurate with the expected life of the well and that will resist water and soil corrosion.

When failure of the casing occurs because of either structural weakness or corrosion, caving material enters, obstructs the water inlet and makes it necessary to recondition the well. This may sometimes be done by inserting a smaller casing inside the old one, breaking up the debris in the well with a drilling tool, and bailing and pumping out the fragments. In cases where the fissures and water passages in the formation become obstructed, the use of suitable chemicals and mechanical and air agitation is useful in dislodging the obstructions.

In very difficult cases of inadequate production in rock wells, explosives are sometimes used. Dynamite is generally used for breaking up the obstructions in wells 400 to 700 ft. deep. This method is not desirable for shallow wells as the ceiling and nearby surface conditions may be disturbed, and caving material admitted. In wells ranging from about 700 to 1,800 ft. in depth, heavy charges of nitro-glycerin have been exploded after milder remedies failed to increase production. Following the explosions, the fragments are removed from the well, the formation is agitated with air or water and the well tested for improvement.

Conclusions

(1) In attempting to increase the production of wells, agitation by mechanical means, such as by air, pumping, bailing and back washing, should be tried first.

(2) If satisfactory results are not obtained by agitation, suitable chemicals should be introduced into the well screen, which should be adapted to the particular type of incrustation to be removed. The pumping equipment should be removed while the chemicals are in the well.

(3) The extraction, cleaning and resetting of well screens insures a very thorough job if a crew of experienced well men is available.

(4) The use of explosives in breaking up obstructions in rock wells of medium to greater depth is sometimes beneficial. This method is not advisable in shallow rock wells or in wells in unconsolidated formations. However, cases are on record in which the explosion of dynamite caps or detonators in wells of the latter type has improved production.

(5) In order to reduce the possibility that reconditioning work in wells will become necessary it is recommended that they be soundly constructed and that experienced drillers familiar with the local formations be employed in sinking them.

G. M. & N. Develops Economical Rail-Top Crossing

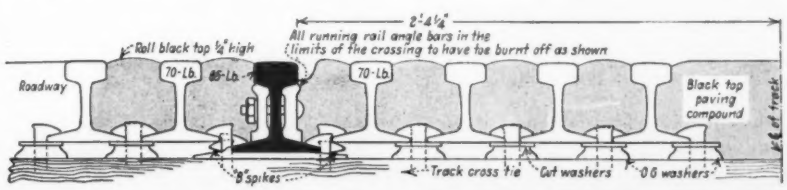
THE Gulf, Mobile & Northern has developed a type of rail-top crossing that can be constructed quickly and economically of scrap rail of any available size without the use of creosoted wood or shims. In this method of construction, OG washers and flat cut washers are used instead of creosoted wood shims between the base of the crossing rail and the ties, and Amesite, or a similar paving compound, is tamped in place between the rails.

Preparatory Work

Before the crossing is installed, the track through the crossing is placed in first class condition for line, surface, gage and cross level. All old ties in the crossing are renewed and the track is fully plated. Worn out or old dirty ballast is removed and the track is usually given a light running surface on clean ballast. In addition, any unfavorable drainage conditions are corrected. Scrap rails of good scrap quality and all of the same weight are selected for the crossing and the ends of these rails which form the end of the crossing are beveled at an angle of approximately 30 deg. with the horizontal by cutting them with a torch. The toes of the regular track angle bars within the limits of the crossing are removed with a torch.

Installation

To install the crossing, beginning on one side of one of the track rails, second hand or "B" spikes (see drawing) are driven through the unused spike hole of the track tie plate in alternate ties, with the head of the spike turned away from the rail; then a row of OG washers ¾ in. or ⅞ in. thick are placed, one on each tie, about six inches from the base of the track rail. A scrap crossing rail is set in place parallel with the track rail, with the edge of its base adjacent to the track rail resting on the heads of the "B" spikes and the other edge resting on one side of the OG washers. Additional one-inch cut washers may be used, if necessary, under the "B"



Cross Section of One-Half of a Crossing Showing Details of Spiking and Installation of the Washer Shims

spikes and on the OG washers to raise the crossing rail level with the top of the track rail. The crossing rail is then spiked down at alternate ties by spiking through the unused spike hole in the track tie plates and through the hole in the OG washers. Another row of OG washers is placed on the ties, another crossing rail laid in place and spiked on each side at alternate ties, through the holes in the washers, etc. The crossing rails are placed on each side of the track rails in this manner, four on the gage side and two on the outside of each track rail.

After the crossing rails are in place, Amesite, cold-rolled asphalt or other similar material is used and tamped into the spaces under the rails between the washers and the ties. More Amesite is added and tamped until the space between the rails is filled. The Amesite between the rails is finally rolled and finished with a slight crown between the rails extending ¼ in. above the level of the top of the rails to allow for further compaction under traffic.

With this type of crossing, 12 lines of scrap crossing rails are usually used, leaving a space in the center of the track about 14¼ in. wide, which serves to insulate the crossing.

Scrap Material Used

Most of the material used in these crossings is scrap, including the rail, angle bars (except the track angle bars) and the washers. The spikes used, except the regular track spikes, are second hand. Additional economy results from the fact that this type of crossing can be installed very quickly, eliminating the necessity for customary sawing and fitting of creosoted wood shims on the ties in constructing the conventional type of rail top crossings. The time saved in installation is helpful in solving the problems of traffic congestions, detours, etc., which arise with work of this kind.

Rail Production Staged Large Comeback in 1939

BORNE of actual needs and prospects for improved business conditions, the production of rails in the United States during 1939, according to statistics compiled by the American Iron and Steel Institute, increased to 1,312,647* tons, nearly double the 697,642 tons produced in the preceding year, and was higher than in any year since 1930, with the exceptions of 1936 and 1937, when production was 1,366,228 tons and 1,619,228 tons, respectively. Incidentally also, the amount of rail produced in 1939 was 861,773 tons more, or nearly three times as large as that produced in 1932, the low point in production during the depression.

As might be expected in view of such a large increase in total tonnage, the tonnages in all weight classifications in 1939, except one, exceeded those in 1938. In this connection, however, it is significant that the percentage increase in the production of rails in the heaviest weight classification, including those of 120 lb. and heavier, was considerably greater than that of the total increase, showing a definite continuation of the trend toward the use of these heavier sections of rail. In the heaviest sections rolled, including those of 136 lb. and over, production increased from 2,522 tons in 1938 to 34,375 tons in 1939, or more than 1200 per cent, and was back more in line with the production of these heaviest sections in 1936 and 1937, which was 25,402 tons and 34,987 tons, respectively. Furthermore, in the weight group including sections from 120 lb. to 136 lb., production in 1939 was not only sharply up, but, as compared with 1938, it showed a greater percentage increase than the total increase in the production of all rails. In 1939, the tonnage in this group was 480,675, compared with the tonnage of 188,034 in 1938, an increase of approximately 155 per cent, whereas the percentage increase in total rail production during 1939 over 1938 was only about 88 per cent.

As in the case of the heaviest sections, the production of sections weighing from 100 lb. to less than 120 lb., was relatively high in 1939, this reaching 620,992 tons, as compared with 371,534 tons in 1938. With the exception of the production in 1936 and 1937, this represents the largest production in these sections since 1930.

In the lighter sections, including 85-lb. rails and those weighing less than 100 lb., the increase in production over 1938 was relatively small, the production in 1939 being 63,598 tons, as compared with 57,550 tons in 1938, an increase of only about 15 per cent, and in the case of sections in the "60-lb. and less than 85-lb." group, production in 1939 actually decreased below the low figure of 27,627 tons in 1938, amounting to only 20,013 tons.

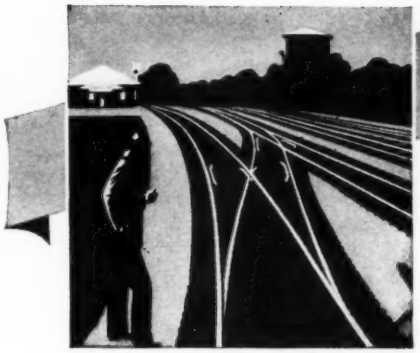
As usual, the bulk of the rails produced in 1939 was from open-hearth steel, the tonnage in this classification amounting to 1,281,380, or 97.61 per cent of the total production. The production of rails from Bessemer and electric steels continued insignificant as regards the total, amounting to only 209 tons, and all of the rails produced from these steels were in weights of 60 lb. or less. In addition to the rails rolled from new steel in 1939, the total production of 1,312,647 tons included 24,666 tons of rails rolled from old rails; 35,618 tons of girder and high tee rails; and 316 tons of alloy steel rails, the last mentioned representing the smallest quantity of such rails rolled during at least the last 18 years, for which records are readily available, and indicating almost complete abandonment of attempts to use rails of an alloy content.

Production of Rails by Weight Per Yard (Net Tons)

Years	Under 50 pounds	50 and less than 85 pounds	85 and less than 100 pounds	100 and less than 120 pounds	120 and less than 136 pounds	136 pounds and over	Total
1920	547,728	485,333	1,066,937		816,612		2,916,610
1925	183,240	246,006	857,215		1,833,027		3,119,488
1926	220,931	287,041	893,382		2,202,413		3,603,767
1927	181,256	194,048	604,178	1,472,155		691,627	3,143,264
1928	150,301	140,813	521,240	1,348,199		804,639	2,965,192
1929	158,326	115,297	458,783	1,381,631		934,758	3,048,795
1930	107,101	91,055	300,024	935,756		664,085	2,098,021
1931	56,100	28,587	138,206	555,242		518,546	1,296,681
1932	18,654	15,350	32,024	240,902		143,944	450,874
1933	*55,010	†17,263	45,890	172,488		175,601	466,252
1934	*78,495	†19,164	82,476	550,639	365,055	35,622	1,131,451
1935	*63,982	†16,529	95,902	381,696	172,891	65,921	796,921
1936	*107,644	†23,629	111,956	684,910	412,687	25,402	1,366,228
1937	*113,889	†92,219	126,155	815,280	436,698	34,987	1,619,228
1938	*50,375	†27,627	57,550	371,534	188,034	2,522	697,642
1939	*92,994	†20,013	63,598	620,992	480,675	34,375	1,312,647

*60 pounds or less yer yard.
†Over 60 and less than 85 pounds per yard.

*All figures of production are in net tons.



WHAT'S the Answer?

What Is Pump Slippage?

What is pump slippage? What causes it? How can it be overcome?

Caused by Poor Fit

By G. S. CRITES
Division Engineer, Baltimore & Ohio, Punxsutawney, Pa.

Pump slippage is the flow of the pumped fluid between the piston and the cylinder walls. It is caused by a poor fit of the piston, piston rings or packing with the walls of the cylinder. This may be the result of mechanical imperfections, wear between the contact surfaces of the piston and the cylinder or worn rings or packing. The drag of pistons in horizontal pumps is likely to set up more wear and slippage than usually occurs in vertical pumps, for in the latter there is no such drag.

Good piston packing will stop or reduce slippage in liquid pumps. The packing should be rectangular, usually square in cross section, and not large. A dimension not larger than ½ in. is recommended for large pumps and somewhat less for smaller ones. The packing should absorb some, but not too much of the liquid, to aid lubrication. Braided or fabricated fibre, holding a lubricating composition of graphite, gypsum, asbestos or other suitable lubricants for non-corrosive liquid is used for packing. A soft pliable packing is recommended for cold liquids and a hard compressed packing for hot liquids. For corrosive liquids and gases, non-corroding pumps must be used, fitting the pump materials to the corrosive liquids to be pumped.

To prevent slippage when pumping air or other non-corrosive gases, metal piston rings are recommended. The piston rings should be small in comparison with the piston or they will drag on the walls of the cylinder and cause wear. They should be lubricated to prevent wear, as well as to perfect the seal between the rings and the walls of the cylinder.

To reduce pump slippage, one should get a good pump in the first place and then use packing and piston rings suitable for the fluid pumped. Slippage is clear loss, for it requires power, which costs money, to churn fluids back and forth in the cylinder.

It Lowers Efficiency

By C. R. KNOWLES
Superintendent Water Service, Illinois Central, Chicago

Roughly, pump slippage may be defined as any condition that interferes with or lowers the efficiency of the pump. There are many things that interfere with the efficient delivery of water by a pump, that can be classified as slippage. Loose or worn packing may permit water to pass between the piston and the cylinder walls, thus reducing delivery. This may be overcome by proper packing. On the other hand, tight packing in the water end of a pump may cause undue friction, thus decreasing the efficiency of the pump. There is little choice between the packing being too tight or too loose, so that in packing a pump it is desirable that a nice balance be maintained between these extremes.

Other common causes of pump slippage are worn valves and valve seats, missing springs, missing valves and springs with incorrect tension. It is obvious to any one who is familiar with pump mechanism that valves should be in proper condition and properly seated, to insure against

Send your answers to any of the questions to the What's the Answer Editor. He will welcome also any questions you wish to have discussed.

To Be Answered In August

1. *Are there any advantages in the use of heat-treated nuts on frog and crossing bolts? If so, what?*
2. *What is the most satisfactory and economical method for getting paint gangs, including material and equipment, to and from work?*
3. *What is the most satisfactory arrangement for the timbers under a railway crossing? Why?*
4. *What methods should be followed in making repairs to underwater portions of masonry sub-structures?*
5. *Should switch stands for main-track turnouts be placed on the turnout side of the track or should they be placed on the engineman's side for trains facing the switch? On sidings and yard ladders? Why?*
6. *When painting steel tanks in warm weather, how can the tendency of the steel surface to sweat be overcome? What effect does it have on the paint?*
7. *When cutting the right of way, is there any advantage in cutting brush and tree seedlings below the ground surface? Why?*
8. *What kind of flooring is most suitable for a shop in which heavy materials are handled? What are the advantages?*

slippage. This is particularly true of suction valves. Correct spring tension is necessary because springs with too little tension may cause slow closure of the valve, while tight springs may conceivably cause excessive pressures. These comments with respect to pump valves apply in somewhat less degree to check valves.

Water-logged air chambers may be the cause of pump slippage; where air chambers are provided, they should be kept filled with air. Leaking priming valves which permit water to pass through them are another cause of pump slippage, since they also reduce the efficiency of the pump. Improper seating of valves and improper use of cushion valves may cause short stroking, which can be classed as a form of pump slippage.

Again, improper priming of pumps may cause them to become air-bound, thus reducing their efficiency. The size of the suction and the discharge lines may have a decided influence on pump slippage, since they are factors in the efficiency of pump delivery. Roughly, a suction line should be of sufficient size to permit a water velocity of 240 ft. or less per min., while the discharge pipe should permit a discharge velocity of not more than 300 ft. per min.

While the foregoing comments refer chiefly to pumps of the reciprocating type, slippage is also important in centrifugal pumps. Briefly, the principal cause of slippage in centrifugal pumps is worn wearing rings. Again, to obtain the maximum efficiency from a centrifugal pump, it should be designed for the actual head under which it is operated. The foregoing comments respecting suction and discharge lines apply equally to both reciprocating and centrifugal pumps of all classes.

Standard Plans for Stations

To what extent is it advisable to adhere to standard plans for small stations? What factors affect this?

Seldom Used in Entirety

By L. P. Kimball
Engineer of Buildings, Baltimore & Ohio, Baltimore, Md.

Standard plans are usually considered desirable to obtain (a) uniformity of design; (b) an arrangement best suited to the needs of operation, which, in general, are repeated in towns of approximately the same size; and (c) a repetition of materials that have been found to require the least maintenance. A standard plan can be modified to suit an extraordinary local need, without introducing material that deviates from the standard design. Adopted standards usually include simple design that can be constructed readily and represent economic use of materials.

We have standard plans for several frame station buildings. They are similar in design, varying only in the size of the different rooms provided. During the period of the railways' progress, when new lines were being constructed and new stations were being established on existing lines, they were used frequently for the smaller communities, selection being based on judgment of the size most likely to prove satisfactory at each point. At present, these plans are seldom used in their entirety, but we find frequent use for them as base plans or guides for structures that require sufficient adjustments of and additions to the standard plans to suit the needs of the particular locality, to make the preparation of an individual drawing necessary.

We have found it more desirable to establish standard plans of small size for the details of doors, windows, etc., that can be used readily in conjunction with a general plan and thereby reduce, so far as possible, the amount of new drafting required for such projects.

Do Not Use Old Plans

By A. T. Hawk
Engineer Architect, Chicago, Rock Island & Pacific, Chicago

Standard plans should not be used today, unless they have been newly prepared or revised recently. Even then it is imperative that they be scrutinized closely with respect to both the general features and the details. Conditions with respect to the demands being made on railway buildings have changed so greatly during the last few years, and are still changing, that it is not safe to assume that plans that were entirely adequate five or ten years ago, will be even suitable today. For this reason, a careful check should be made of present requirements and possible increases in some of the station activities should be investigated. As an example, there appears to be a present trend toward an increase in express shipments and toward a small decrease in parcel post and light-freight shipments.

Stations constitute the headquarters of the railway in the towns, and obviously should be so arranged as to meet the needs of the communities they serve. Above all else, however, they should be well built and as pleasing in design as conditions warrant. The small station should be designed carefully, keeping in mind the fact that materials must be selected that will insure long life and minimum maintenance. This refers to exterior and interior wall surfaces, roofing and floors. Special consideration should be given to insulating outside walls and ceilings in rooms that are to be heated, and in many cases the floors should also be insulated, this being particularly true for frame buildings.

In not a few cases one stove will be sufficient to heat both office and waiting room, provided a part of the partition wall is omitted and the stove is set in the opening thus left. Where this is done, a diamond-mesh screen grill, a half circle, can be placed on the waiting room side of the stove. This will leave the office side open for the convenience of the agent in firing the stove to suit his needs and those of the waiting room space.

Recently developed oil-burning radiant heaters have a good appearance and provide the desired temperature automatically. They are clean, are easily operated and, with some auxiliary storage of oil, will operate over Sunday or holidays without attention. This will eliminate all question of overtime that might arise by reason of the necessity for the agent to go to the station to maintain the heating when he is not otherwise on duty.

Standard Plans Passe

By General Inspector of Buildings

There was a time when standard plans served a useful purpose, and I was then heartily in favor of them. When a new line was built into undeveloped territory no one knew what the eventual requirements for stations would be, and one kind or design and size filled all immediate needs. Then, the material could be ordered for 2 or 20 stations, as the case might be, with the assurance that in the confu-

sion incident to bringing the job to a close, for stations were among the last structures built, windows for Plan A and doors for Plan C would not be distributed to the stations to be built from Plan B. All of this is over with and we have settled down to a more stabilized existence, so far as external development is concerned.

Today the requirements, even for small stations, vary widely. One community cultivates small fruits; another raises vegetables; still another ships little except grain; while a fourth may be engaged principally in raising stock. Others may have small factories, mills, canning factories or other minor industries, or be located in a popular vacation area. It is obvious that a rigid standard for stations in these communities is out of the question. Personally, I prefer to see standardization of doors, windows, hardware, glass sizes, etc., rather than of the general plan. This will give ample scope to the architect to meet the varying needs of the several communities his road serves, and at the same time will greatly simplify building maintenance.

Conserving Revenue Equipment

What measures can maintenance forces take to conserve the use of revenue equipment when handling company material?

Use Out-of-Season Cars

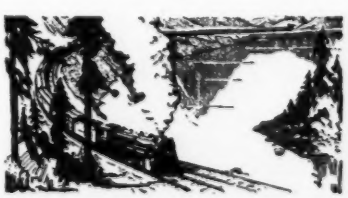
By J. R. Derrick
Assistant to General Manager, Norfolk & Western, Roanoke, Va.

One of the serious problems that confronts the railways is the movement of company material over their own lines for maintenance-of-way use. Some roads use special equipment for such material, but others rely on revenue equipment. It is usually when business is good and cars are in greatest demand that most of the maintenance of way work is being done and the greatest quantities of materials are being shipped and used.

So far as possible, company material should be shipped in carload lots and be billed directly from the point of origin to the supervisors responsible for its distribution, and to the station nearest the point where the distribution will begin. When a shipment is made, the supervisor should be notified promptly and given the car numbers and routing of all carload shipments. When this notice is received, the supervisor should follow the movement of the cars closely to insure that there is no unnecessary delay at terminals or other points en route. He should also arrange with the receiving agent to notify him by wire when the shipment arrives. Material should not be ordered or shipped until it has been decided definitely where it is to be used. When it has been ordered, supervisors should give their foremen specific instructions for unloading and should follow the matter to know that the material is being unloaded promptly after it arrives at destination.

So far as practicable, company material should be shipped in cars for which there is least demand. To illustrate, on many roads stock cars are used during only a few months of the year, and can be utilized for company shipments for which they are suitable during the remaining months. There are many instances where some equipment is "out of season" and can then be used for hauling company material. Stock cars may not be ideal for unloading crossties or other material, but revenue is derived from the use of revenue equipment in revenue service, and supervisors should realize that any diversion of revenue cars from revenue service and any delay in unloading them if they are thus diverted will reduce the revenue they might otherwise earn.

In addition to using out-of-season equipment, much can be accomplished by maintenance forces through planning or programming the work so that shipments of materials can be made, so far as practicable, at times of least demand for revenue equipment and also by loading and shipping material to take advantage of what would otherwise be empty movement. Supervisors should avoid the tendency to accumulate an excessive supply of cars for handling company materials or for what they might term emergency use. This feature should be watched carefully to insure that cars not actually needed are not ordered or held. They should watch the loading, movement and unloading of company material at all times to see that they are done with the greatest practicable dispatch.



Do Not Hold Cars

By G. S. Crites
Division Engineer, Baltimore & Ohio, Punxsutawney, Pa.

Careful planning all along the line is one of the important factors in the release of revenue cars for revenue loading. When revenue cars are in demand, on-line loading of company material should be in non-revenue or out-of-season cars. These cars should be loaded, dispatched and unloaded promptly to avoid having the railway littered up with an unnecessary number of such cars. With co-operation from all departments this can be done, but it is discouraging and somewhat disorganizing to rush a car to some place for loading and then not have it loaded promptly. This may be no different, however, from rushing a loaded car to destination only to find that the maintenance forces have delayed the unloading.

Off-line loading of company material will generally be in revenue cars, unless special arrangements are made to send non-revenue cars for such loading. At a time when business is good and revenue cars are in demand, it will be worth while to exert some effort to get off-line loading of company material in non-revenue cars.

The maintenance forces should know at all times what classes of equipment are in demand for revenue loading. It will not always be possible to avoid the use of such equipment, for it is often vital to get the material to the point of use regardless of the equipment available. What the maintenance forces can do, however, is to avoid the abuse of such equipment by using it when unnecessary and by unloading the cars as soon as received. Careful planning will help in moving company material under trying circumstances. Recently, a train load of stone ballast was needed at a time when a record production of coal was in progress. Arrangements were made at the quarry for prompt loading, and bad-order coal cars that were suitable for the service, but which could not reach the repair tracks for more than 24 hours were selected carefully. These cars were assembled, loaded and unloaded and then placed on the repair tracks, with no interference with the car-repair program. In other words, a train of much-needed company material was handled with no tie-up of revenue cars.

Rules that will reduce to the minimum the time that cars that must be used for shipping company material are out of revenue service may be summarized as follows: Know what cars are needed for revenue loading; keep a reliable and up-to-the-minute record of material that is under load or that is awaiting shipment; plan the loading, movement and unloading so that the car will be in company service the shortest possible time. If these rules are followed, revenue cars will not be tied up unduly.

When Renewing Ballast

When changing the type of ballast, under what conditions should the track be given a heavy lift? A light lift? How should the work be done?

Lift High in Sags

By L. D. Gardner
Roadmaster, St. Louis-San Francisco, Tulsa, Okla.

It is best to give the track a heavy lift in sags, cuts and at points where ties have been churning or the old ballast is holding water. On the other hand, at high points, which will be found in any track that has not had a ballast renewal for several years, a light lift may be the only practical way to prevent too great a lift on either side. In this case, however, the old ballast should be dug out and disposed of on the shoulder of the roadbed.

Under ordinary conditions, track should be given a light raise and all ties should be renewed and spaced correctly ahead of the ballasting. All old ballast except, as explained, at the high spots, should be cribbed out to the bottom of the ties and the old shoulder should be cut down enough to insure free drainage. The new ballast should then be unloaded and used for giving the track a second raise, which should be just enough to permit a good job of tamping.

Depends on Ballast

By Joseph H. Becker
Section Foreman, St. Louis-San Francisco, Rush Tower, Mo.

When changing ballast, the amount of raise that should be made will depend on the kind and size of the ballast to be applied; that is, whether it is gravel, chatts or crushed rock. If the new ballast is rock the raise will be greater than if chatts or gravel are to be used, partly owing to its larger size. Again, if washed gravel of such size that much of it must be put through the crusher is to be applied, the raise will be greater than may be necessary for pit run gravel or washed gravel of pebble size.

In any event, the minimum raise must be sufficient to permit a good job of tamping. In other words, while there are other factors involved in deciding on what raise shall be made, the kind and size of the ballast to be used determines the minimum raise.

Many Factors Involved

By District Engineer

Like so many questions that can be asked about track maintenance, several factors are involved and the answer must be contingent on one or more of them. In the first place, the amount of the raise will depend on the depth and performance of the old ballast. There are many miles of main-line tracks today that do not have sufficient ballast to support properly the traffic that passes over them. There are other places where the present ballast is of inferior quality and does not drain freely. In either or both events I believe that the track should receive a heavy lift.

It should not be lost sight of that ballast is renewed for definite reasons—either the present ballast is insufficient or its performance is unsatisfactory for other reasons. Likewise, a new type of ballast is usually selected that is superior to that in use. Obviously, therefore, the whole purpose of making the change will be nullified if the policy is adopted, as is done too often, of making only enough raise to give the track a new surface. Certainly the track will need to be surfaced; if it does not, there is no point in applying the ballast. While this is one purpose of the ballast renewal, the primary purpose is always to provide the track with a dependable, free-draining support that will distribute the traffic loads to the subgrade and thus insure its stability as well. Insufficient or water-holding ballast eventually causes the development of soft track, which in this day and age must be avoided sedulously.

I am in favor of making 4 in. the minimum for raising the track when changing the type of ballast. If the existing ballast is of insufficient depth, this should be increased to 12 or more inches, as the situation warrants. The amount of the additional depth desirable can be determined, however, only after a careful study of all of the conditions surrounding the job. All sags and inequalities in the surface should be smoothed out, and this may require some additional depth of ballast. If a sag requires more than, say, 12 in. of additional ballast, I would use locomotive cinders to make the first raise and thus economize on the more expensive material.

What Makes Walls Turn Yellow

What causes light-colored interior walls to turn yellow? How can this be prevented?

May Be Inferior Oil

By E. C. Neville
Bridge and Building Master, Canadian National, Toronto, Ont.

When light-colored interior walls turn yellow it is usually because an inferior oil has been used in the vehicle. Paint that is mixed with pure linseed oil will bleach out to a lighter shade after it has been on the surface for some time, but it seldom turns yellow. When the vehicles consist of an impure oil or one that has been adulterated with a mineral oil, the paint generally turns yellow as it ages. Exterior paint sometimes turns yellow by reason of exposure to certain gases in the air, but this is less likely to occur in interior painting.

On new work, particularly on plaster walls that have not been given an opportunity to age or cure properly, there is a tendency for the paint to take a slightly yellow tinge in the process of aging. Again, where a coat of flat paint is applied over old paint that has a high gloss, the new coat may be expected to absorb a portion of the oil and some of the color remaining in the old paint, and this will give the new paint a yellow cast.

To overcome this difficulty, care

should be exercised to secure pure linseed oil for mixing and, when applying the paint on plaster surfaces, to see that the plaster has been properly aged and sized before the paint is applied. When painting over a surface that has been painted with a paint that was rich in oil, or that has a high gloss, it is good policy to sandpaper the old surface before applying the new paint.

Too Much Linseed Oil

By L. G. Byrd
Supervisor Bridges and Buildings, Missouri Pacific, Poplar Bluff, Mo.

It has been my experience that the most common cause of light-colored interior walls and ceilings turning yellow is that too much linseed oil has been used in mixing the paint. The same general principles that apply to painting exterior surfaces apply with equal force to the painting of interior surfaces. On the other hand, the formulas for mixing the paint may differ somewhat widely, since paint applied to interior surfaces is not exposed to the weather. For this reason, the finish may be enamel, gloss or dead flat.

Where an excess of linseed oil has been used in mixing the paint, the oil exhibits a tendency to become a deep yellow; in fact, this seems to be an inherent characteristic of linseed oil when used for inside work. In contrast, if the same amount of oil is used for mixing exterior paint there will be no evidence of tinging. As a matter of fact, when exposed to sunlight it is likely to bleach and become whiter than when it was applied. This is exactly the opposite of the effect found in interiors. To overcome the tendency for light colors to turn yellow, I recommend the use of a good grade of lead mixing oil and flatting oil for interiors.

Inherent in Linseed Oil

By General Inspector of Buildings

Contrary to common belief, the tendency of interior paints to turn yellow is not the fault of the lead pigment; neither can it be traced to the use of mineral oil as an adulterant, although it is conceivable that in some cases this might accentuate the trouble. Another common fallacy is that the trouble results from applying the paint over plaster that has not cured properly. In this event the paint is likely to peel from the wall before it has had time to turn yellow, because the alkali in the green plaster will saponify the oil and thus break the bond between the paint and the plaster surface. Applying new paint over old paint is not a cause of the trouble, as is believed in many quarters, for if the old paint is hidden by the new paint it will have no influence on the later appearance of the wall surface.

It is an inherent characteristic of both raw and boiled linseed oil that they turn yellow when used on interior surfaces where little sunlight can reach them. For this reason, any kind of paint that is mixed with linseed oil and used for finishing interior surfaces may be expected to turn yellow. To prevent the trouble, where practicable to do so, a good enamel can be applied with assurance that it will retain its original tint, since a good grade of enamel liquid does not change color. If it is not desired to use the enamel, the priming coat can be ordinary linseed oil paint, followed by two coats mixed with flatting oil if a flat finish is desired; if a gloss finish is wanted, the flatting oil can be reduced about 25 per cent for the last coat and replaced with slightly more floor varnish.

Jacking Track to Remove Ties

Is it good practice to jack up the track to remove ties instead of digging them in? Why? Does the kind of ballast make any difference?

Is in Favor of Practice

By T. M. Pittman
Division Engineer, Illinois Central, Water Valley, Miss.

When removing old ties from the track it is necessary either to jack the rail up to allow it to be slipped out or to drop the tie far enough below the rail, by digging down the crib, to prevent it binding. When the track is jacked up, several ties on each side of the one to be removed will also be lifted. With certain kinds of ballast the side walls that have enclosed the tie will hold immobile, but with other kinds, some of the ballast will roll under the ties, so that when the track is lowered these ties will rest on this loose ballast and cause irregular surface, and will necessitate additional work to restore the original surface.

To overcome this, some foremen pull the spikes from several ties both ways from the tie that is to be removed, so that they will not come up with the rail. This is not good practice, since there is a possibility that a train will show up before the spikes can be replaced; there is also a possibility of buckling track, particularly in hot weather. Furthermore, the holding power of the spikes is reduced every time the spike is pulled. Where the ballast is of a type that will prevent the ties from returning to their original bed, the track should not be jacked up; the ties should be dug in without disturbing the track. While the jacking method is much faster, it is not suitable under heavy traffic, by reason of the necessity of holding a jack under the rail as well as causing greater disturbance to the track.

When bedding ties, the practice is to dig out between the ties to a depth greater than the tie bed and then knock the old tie into this trench, from which it can be withdrawn easily. The bed can then be prepared for the new tie, the new tie is put into place and tamped and the trench is backfilled. If proper consideration is given to the thickness of the new tie, the disturbance of the old bed will be kept to the minimum. While this method is slower than jacking, it has the advantage of not disturbing the track on either side of the tie to be renewed, and it makes no particular difference if a train does come along before the tie is replaced.

It is apparent that both methods have advantages, and the method to be used will depend primarily on the nature of the ballast and the amount of traffic. Generally speaking, cinders and pit-run gravel lend themselves most readily to jacking, while it is usually preferable to bed in the ties in crushed stone and slag.

Depends on Ballast

By J. B. Bragg
Section Foreman, Chesapeake & Ohio, Prince, W.Va.

It will depend entirely on the kind of ballast whether the track can be jacked up to permit the removal of ties. If the ballast is of a type that remains loose, the track should not be jacked, for some of the material will roll under adjacent ties and hump the track. If the ballast is well compacted and will not run under the ties, I favor jacking just enough to spring the rail from its bearing on the tie, since it can then be pulled out without interfering with the old bed. Anything that will

leave the old bed undisturbed is desirable, for there is no more fertile source of churning track than breaking up old tie beds. For this reason, wherever it is necessary to do so, only clean ballast should be used for the cribs and restoring the shoulder.

It Is Good Practice

By H. R. Clarke
Engineer Maintenance of Way, Chicago, Burlington & Quincy, Chicago

The use of a track jack to spring the rail slightly when removing ties is good practice in most cases. The extent to which the track may be jacked up with impunity will depend on the class of track and the kind of ballast. Track should not be raised to such a height that ballast might run under the ties adjoining the one to be removed. If the ballast is compacted and well set, so that shifting is not likely to occur, the amount of digging required to allow the removal of the old ties can be reduced materially by raising the track slightly.

This is particularly true on secondary lines and on yard and side tracks, on which it is less important to maintain a perfect surface at all times. On these lines, if small amounts of ballast work under adjoining ties and temporarily raises the track slightly, it is not serious. Usually the first train over will settle the track back to its old level. On high speed lines, however, this is not desirable for the passage of even one fast train.

A slight lifting of the track is also an advantage when putting in the new ties, for it allows them to be inserted with less disturbance to the old tie bed, and so results in a more solid bearing, causing the tie that has been renewed to carry more nearly its share of the load. It is possible that some of the equipment now in use or being offered for assisting in the renewals, such as tie saws, tie pullers, etc., may modify materially the methods that have been followed generally heretofore in tie-renewal work.

Sand Blast for Cleaning Steel

Under what conditions is the use of the sand blast desirable for cleaning steel bridges? What is its relative economy?

Describes New Method

By H. T. Welty
Engineer of Structures, New York Central, New York

I have had so little experience with the use of sand-blasting equipment to clean the surfaces of steel bridges preparatory to painting that I am not able to discuss the subject. However, I have recently become somewhat interested in the possibilities of flame-cleaning for steel surfaces prior to painting. This method has the advantage of removing all loose mill scale and loosely-adhering foreign substances, besides which it drives out all moisture, so that the shop paint is applied to perfectly dry surfaces. At present, we are replacing two deck plate-girder spans of a bridge subjected to corrosive conditions somewhat worse than are normally met and, to obtain some idea of the advantages of flame-cleaning, we are having one of these spans flame-cleaned in the shop before painting, while the other is being cleaned and painted in the usual manner. Obviously, it will require some time to reach any conclusion from this test, and it is somewhat questionable whether sufficient advantage will be obtained through the flame-cleaning to warrant its general use, since, as I understand, the cost is about $4 a ton.

No Better Time Than Now

By General Inspector of Bridges

While the economy of using a sand blast for cleaning steel bridges will often depend on the amount of work to be done, the desirability of its use will depend in largest measure on the condition of the surfaces to be cleaned. For a small job the cost of moving and setting up the equipment may make the work more expensive than hand cleaning. In this case the desirability of its use will depend entirely on the condition of the surfaces.

Where a large amount of work is involved, as on multiple or long-span bridges, the sand blast is both desirable and economical, as has been proved by experience on numerous structures, where an excellent job has been obtained with costs ranging from 20 to 75 cents a ton. These costs depend, however, on how experienced and well-organized the cleaning gang is, for it takes only a small amount of lost motion to run the cost up; on the condition of the surfaces to be cleaned; and on their accessibility, for heavy or extensive staging will add materially to the cost.

When a steel structure has been neglected for a long time or it has been subjected to brine drippings; or where dirt, coal dust and cinders have been allowed to accumulate on horizontal surfaces and in pockets; and where leakage occurs through ballasted floors, corrosion is likely to be so severe that the metal carries a heavy scale. Experience has shown that in any of these events no amount of hand cleaning will prepare the surfaces satisfactorily.

Probably at no previous time has there been such widespread neglect with respect to the painting of steel structures as has occurred during the last ten years. It is true that some roads have endeavored to keep their bridges painted normally, but they are in the minority, since most roads, ours included, have done no painting until forced to do so to prevent or arrest rapid deterioration. I can cite numerous instances where, because of small forces or small appropriations, paint has been applied over inadequately cleaned surfaces and, in some instances, with no attempt at cleaning. In none of these cases has corrosion been stopped. It is safe to say that not one of these structures can now be cleaned satisfactorily by hand, even where the most modern power-driven chipping and scaling tools are employed. For these reasons, there is probably no method better adapted for arresting the deterioration that is occurring than the sand blast.

One other situation presents an excellent opportunity to demonstrate the advantages of the sand blast, this being surfaces that have been painted and repainted without removing the old paint film until it has become thick, hard and dry and is checking, cracking or peeling. No better method than the sand blast can be devised for such situations. One word of caution is desirable with respect to sand blasting —the cleaned surfaces should be kept dry and should be painted as quickly as possible after they are cleaned.

Cost Is High

By G. A. Haggander
Assistant Chief Engineer, Chicago, Burlington & Quincy, Chicago

We have confined the use of sand blasting in steel-bridge work to places where there has been a great deal of corrosion because of brine drippings or smoke action. Ordinarily, one sand-blast outfit will care for all of the

work of this type required on our system in any year, even though several paint gangs are working on steel bridges. However, the cost of sand blasting is so high that we prefer to do ordinary jobs of cleaning steel surfaces by hand with power tools. We do, however, use this method extensively for cleaning the inside surfaces of steel water tanks, for this work lends itself to the economical operation of the sand blast.

Maintaining Rail Joints

What items must be given attention in the maintenance of rail joints? What is the importance of each?

Rail Ends Not Square

By J. B. Kelly
General Roadmaster, Minneapolis, St. Paul & Sault Ste. Marie, Stevens Point, Wis.

Difficulties encountered in maintaining rail joints to the required standard do not arise so much from lack of attention as from the fact that very few rail ends are at right angles to the axis of the rail. The out-of-square tolerance allowed by the specifications is 1/32 in., and if this is not exceeded the rails may be tight along one edge and yet show a gap of 1/16 in. along the other edge when two adjacent rails have this limit of tolerance on the corresponding edges. As a matter of fact, this tolerance frequently exceeds that permitted by the specifications.

As a result of the tremendous expansive force exerted by rail under rising temperature, a low or high, or a line-kinked joint is produced, depending on which edges of the out-of-square joints are in contact. For this reason, I believe that the specifications should require that the rail ends be squared up by milling or grinding before they leave the mill.

If the rail ends are hardened before the rail has been subjected to initial cold rolling by wheels, the surface at the ends will be high and the head will tend to flatten at the ends of the shorter angle bars. Joint bars for new rail must fit properly, that is, without tolerance. As it is, in addition to the acceptable crown that keeps the joint slightly high, many others have a droop that lets the rail ends down and thus become the immediate occasion for attempts on the part of the section foreman to correct a low joint.

In the older track, the fishing surfaces of the rail ends and the bars eventually become so worn that no amount of labor will correct the faulty surface, but will cost more than it will to install joint shims or renew the joint bars with crowned bars, with or without rail-end welding. By the time rail has been in use for a few years, joint shims should be applied as needed, to restore worn joints, and this will often delay the necessity for a general replacement.

New rail is seldom laid without surfacing and restoration of the ballast section. However, where this is neglected, considerable damage may be done to the joints, and if the track is not to be surfaced, provision should be made for caring for the joints to prevent damage.

Expansion Gaps and Bolts

By L. D. Gardner
Roadmaster, St. Louis-San Francisco, Tulsa, Okla.

One of the important items in the maintenance of rail joints is the expansion gap between rails. If the joints are too open the rail ends will batter, and no amount of labor will be able to keep them in first-class condition. If the rail is too tight, the flowing metal will lap over on the adjacent rail and eventually cause chipping and a joint condition as bad or worse than a battered joint.

Bolts are next in importance. They should be kept tight and to the same tension at all times. If either of the foregoing items is neglected, wear on the fishing surfaces will be excessive and the joint will be out of hand until the proper measures are taken to recondition it. Of equal importance, and many maintenance men believe of greatest importance, the joint ties should be sound, correctly spaced and tamped to a sound bearing.

Reduces Rail-End Batter

By J. Morgan
Retired Supervisor, Central of Georgia, Leeds, Ala.

A high standard of joint maintenance should be considered vital by every trackman, from chief engineer to laborer. With all joints applied correctly in the first place, and then maintained with tight bolts, on sound ties and to a solid bearing, the cost and effort required for their maintenance will be only a small fraction of that necessary where carelessness has been a feature of application and neglect occurs in maintenance, for the time will come when no amount of labor will be able to keep them in repair.

I prefer to use spring washers rather than to omit them, and to keep the bolts to a uniform tension. No joint can be kept to a high standard where the rail creeps, so that anti-creepers are definitely an adjunct to good joint maintenance.

Keep Bolts Tight

By W. Woolsey
Section Foreman, Illinois Central, Chicago

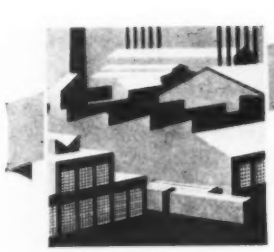
If rail joints are to be maintained properly, the bolts should be kept tight. Loose bolts lead to loose joint bars, and generally constitute the first step in poor joint maintenance. Any looseness in the joint assembly permits relative movement of the parts and this will permit undue wear on the surfaces in contact. Again, joints cannot be maintained to the desired standard unless the joint ties are sound and are always tamped to a solid bearing, and better results are obtained where they are spaced correctly.

Dirty ballast or ballast made from inferior materials has a damaging effect on rail-joint maintenance, because drainage is always below normal, and the ties churn. To insure good joints, they must be kept to the surface of the remainder of the rail, and battered or worn rail ends should be restored by welding.

Must Watch Details

By J. M. Noblitt
Section Foreman, Denver & Rio Grande Western, Thompson, Utah

If one expects to maintain rail joints to any reasonable standard, he must maintain the joint bolts to an even tension of sufficient magnitude to eliminate relative motion of the parts of the joint assembly. This will minimize wear on the fishing surfaces. He must maintain proper expansion gaps at the rail ends to minimize batter and the probability of flowing metal lapping over onto the adjacent rail to result in a chipped rail. Joint tie plates must be used on sound ties and the joint ties must be kept tamped to a solid bearing. Frequent light lifts of the track as a whole to maintain surface prevent bent rail.



PRODUCTS of Manufacturers

Two New Mall Saws

THE Mall Tool Company, Chicago, Ill., has added two pneumatic saws, a 12-in. pneumatic circular saw, known as the model P-120, and a 24-in. pneumatic chain saw, to its line of portable

The P-120 Pneumatic Circular Saw

and power operated saws, which are adapted to many types of railroad bridge and building and preframing work.

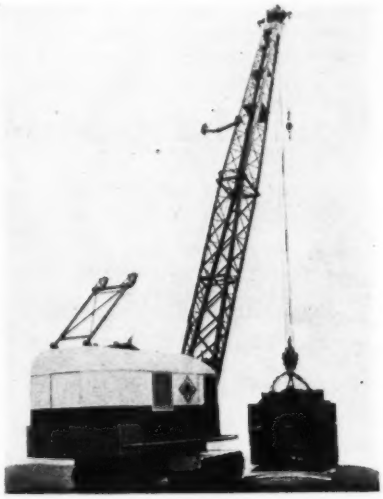
The P-120 circular saw weighs 29 lb. and has a free speed of 1400 r.p.m. It is operated by compressed air at 90 lb. pressure by an air motor which at that pressure has 2.7 hp. and consumes 70 cu. ft. per minute. The saw has a cutting capacity of 4⅝ in., and an adjustment is provided for the depth of cut. A swivel base permits cutting at any angle up to 45 deg. The exhaust air of the motor is utilized to keep the cutting line and observation glass clear and the saw is equipped with the patented Mall telescopic safety guard which gives complete protection to the operator at all times.

The 24-in. pneumatic chain saw weighs 50 lb. and is designed also to operate with compressed air at 90 lb. pressure. At that pressure the air motor of this unit has 3.5 hp. and consumes 95 cu. ft. per minute. The free speed of the chain is 1,000 ft. per minute and the saw has a cutting capacity of 24 in.

The New Pneumatic Chain Saw Weighs 50 lb. and Has a 24-in. Cutting Capacity

Heavy-Duty Crawler-Crane

THE Lima Locomotive Works, Inc., Shovel and Crane Division, Lima, Ohio, has added a heavy-duty 60-ton crawler crane to its line of cranes, which now range in capacities from 13 to 60 tons. The new crane is built with the same features embodied in the other Lima cranes, which are said to adapt them to work requiring unusual versatility and positive, accurate control. A number of the features of these cranes include independent clutches for hoist, travel, swing and boom up or down simultaneously, four drums and a worm-gear-driven boom hoist. The drums are of large diameter, effecting greater cable economy. Other features are vacuum-controlled clutches; helical cut main gears; roller bearings for principal bearing points; square lever shafts, insuring positive lever action, and proper balance of weight to allow the operation of long booms at low angles. It is said that special steels



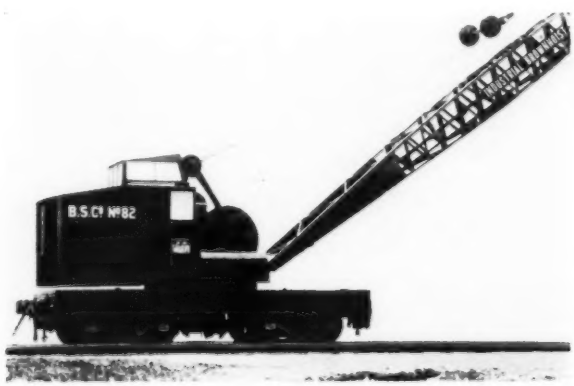
The Lima 60-Ton Crawler Crane

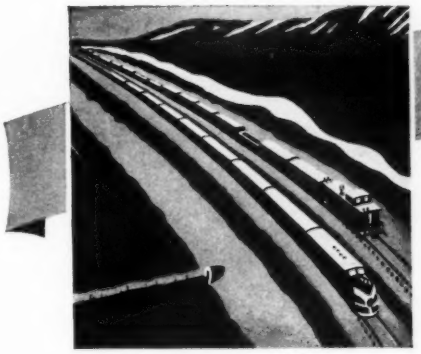
are used throughout to effect economical operation and to insure that delays on the job will be a minimum.

Monitor-Type Crane Cabs

AN improvement in locomotive crane design is the Monitor-Type crane cab developed by Industrial Brownhoist Corporation, Bay City, Mich., which allows the operator 100 per cent visibility in all directions. The Monitor-Type cab, as its name implies, projects above the level of the remainder of the crane housing and is enclosed on all four sides by windows. It is streamlined in appearance and is said to permit faster hoisting and rotating speeds and increased output with reduced accident hazard because the operator can see the entire working area. In addition, the windows on all four sides allow better ventilation.

The Monitor-Type Crane Cabs Allow Complete Visibility and Better Ventilation





NEWS of the Month

New Bridge Bill Passes the House

H. R. 9381, a bill similar to the Truman-Hobbs bridge bill, which was vetoed by President Roosevelt last year, was passed unanimously without a record vote by the House of Representatives on May 6, and has since been reported out favorably by the Senate committee on interstate commerce. The bill provides relief for railroads with respect to the cost of rebuilding bridges required to be altered in connection with waterway projects.

Railroad Equipment Exports Jump 146 Per Cent

Exports of railway equipment from the United States during the first three months of the year totalled $4,138,073, as compared with $1,685,156 during the corresponding period of 1939, an increase of $2,452,917, or 146 per cent, according to the Bureau of Foreign and Domestic Commerce. These exports, including rolling stock and parts and miscellaneous equipment, expanded rapidly in December, 1939, and continued to rise in volume through March, 1940.

Johnson Appointed to I. C. C. Succeeding Caskie

On May 14, the Senate confirmed President Roosevelt's appointment of Colonel J. Monroe Johnson to the Interstate Commerce Commission to succeed Marion M. Caskie for an unexpired term which runs until December 31, 1941. Col. Johnson, who is an engineer from South Carolina and a World War veteran, was assistant secretary of commerce, with jurisdiction over all transportation activities of the Department of Commerce, including the Inland Waterways Corporation, before his appointment.

Bill for Grade Crossing Work in Fiscal 1942 and 1943

The federal aid highway authorizations bill H. R. 9575, introduced in the House of Representatives on April 29, contains authorizations for appropriations of $50,000,000 for grade crossing elimination and protection work in each of the fiscal years ending June 30, 1942, and June 30, 1943. The grade crossing appropriation for the current fiscal year ending next June 30 is $20,000,000 and for the fiscal year 1941 is $30,000,000. The sum of $50,000,000 was appropriated in each of the fiscal years 1938 and 1939. The bill also authorizes a federal-aid highway appropriation of $125,000,000 for each of the fiscal years 1942 and 1943, as well as $25,000,000 to be expended in each of these years on secondary or feeder roads.

President Vetoes $110,000,000 Rivers and Harbors Bill

On May 21, President Roosevelt vetoed the $109,985,450 rivers and harbors authorization bill, a compromise measure, which passed the House last year as an $83,000,000 measure and the Senate on April 25 as a $150,000,000 measure. The President indicated that he was opposed at this time to adding to the backlog of rivers and harbors authorizations but added that he would be glad to approve separate legislation covering the few items in the bill that are of national defense value.

C. & N.W. Wins Safety Award

The National Safety Council on May 15 announced the winners in 1939 among 180 Class I standard railroads in the thirteenth annual Railroad Employees Safety Contest. Winner of Group A for roads with 50,000,000 or more man-hours was the Chicago & North Western with a casualty rate, killed and injured, of 3.53. The Union Pacific was the winner in 1936 and 1938 and also had the lowest casualty rate in 1937 and 1939, the rate in the latter year being 2.57, but because of a rule of the contest that no railroad may win the award for two successive years, the award was made this year to the North Western.

The winners in the other groups were as follows: Class B, the Atlantic Coast Line; Class C, Mobile & Ohio; Class D, Maine Central; Class E, Charleston & Western Carolina; and in the Class F group, the Mississippi Central. In the Class C and Class D groups, the Chicago, St. Paul, Minneapolis & Omaha and the Duluth, Missabe & Iron Range, respectively, had the lowest casualty rates, but were ineligible for first place honors because of winning in their respective groups in 1938.

Committee Votes 36 Cents Minimum Wage Rate

The Railroad Carrier Industry committee under the Fair Labor Standards Act has recommended a minimum wage rate of 36 cents an hour for the employees of Class I roads and 33 cents an hour for the short lines. During the hearings before the committee, representatives of the railroads testified that it would cost the Class I roads $6,903,609 a year to increase the minimum wage to 36 cents. Colonel Philip B. Fleming, administrator of the Wage and Hour division, will soon schedule a separate hearing on the committee recommendation at which any interested person may appear. At the close of this hearing the administrator can either approve or disapprove the recommendation. If he approves he will issue a wage order having the force of law.

Laws Compelling Wasteful Employment Perilous

Joseph B. Eastman, chairman of the Interstate Commerce Commission, in a discussion of S. 2009, the general transportation bill, before the Western Railway Club at Chicago on May 20, said, "The House amendment (to prohibit consolidations which would displace any employees) went beyond any reasonable protection and arbitrarily disbarred the railroads from one possible opportunity to conduct their operations with greater economy. It thus undertook by fiat to compel wasteful employment . . . It is clearly unsound and contrary to the best interests of the country to compel wasteful work to be performed anyhow or anywhere at any time, and it is particularly perilous to all concerned, including the employees, to apply such doctrine to the railroads under present conditions."

Bills To Increase Payments To Railroad Unemployed

Two bills have been introduced in the Senate, both designed to increase benefit payments under the Railway Unemployment Insurance Act. Both bills are based on the principle that the reserve fund for the payments of benefits to unemployed workers is too large and that the amount of benefits should be increased. However, S. 3920, offered by Senator Wagner, which represents the views of railroad labor, would preserve the present 3 per cent tax on the payroll of the carriers and increase present benefits by approximately 115 per cent. The other bill, S. 3925, introduced by Senator Gurney, which embodies the views of railroad management, would increase the present benefit payments by about 25 per cent and provide for a rating system, so that if the employment record of the railroads remains good, the rate of the tax may be gradually reduced, as is the practice in some of the states.

Personal Mention

General

E. G. Whitman, maintenance engineer of the Minneapolis, St. Paul & Sault Ste. Marie, with headquarters at Minneapolis, Minn., has been promoted to transportation assistant, reporting to the general superintendent, with the same headquarters.

D. C. Gough, assistant superintendent on the Canadian National at Prince Albert, Sask., and an engineer by training and experience, has been promoted to superintendent, with headquarters at Kamloops, B.C. Mr. Gough was born in London, England, on January 27, 1888, and entered Canadian National and predecessor companies' service on May 7, 1912, as an instrumentman, subsequently serving as a resident engineer in the construction department and instrumentman in the engineering department at various points, except for the period from 1915 to 1919, when he enlisted and served overseas in the World War, being promoted through various ranks from private to intelligence officer. In April, 1929, he was promoted to roadmaster at Kamloops, and in August, 1937, he was advanced to assistant superintendent at Kelowna, B. C. Mr. Gough was appointed acting transportation assistant of the Vancouver Island Lines, with headquarters at Victoria, B. C., on May 23, 1939, and on February 1, 1940, he was appointed assistant superintendent at Prince Albert, Sask., the position he held until his recent promotion, which was effective May 1.

James P. Newell, Jr., whose promotion to superintendent of the Logansport division of the Pennsylvania, with headquarters at Logansport, Ind., was announced in the May issue of *Railway Engineering and Maintenance,* was born at Carthage, Mo., on September 18, 1902, and was graduated from Princeton University in 1924. He entered railway service in 1927 as an assistant on the engineering corps of the Pittsburgh division of the Pennsylvania, and the following year he was promoted to assistant supervisor of track at Sharpsburg, Pa. In December, 1928, he was transferred to Carnegie, Pa., and in July, 1929, he was promoted to supervisor of track on the Buffalo division, with headquarters at East Aurora, N. Y. Mr. Newell later served as supervisor of track on the E. & A., Pittsburgh, Middle and Maryland divisions, being located at Wilmington, Del., in May, 1934, when he was promoted to assistant division engineer of the Middle division, with headquarters at Altoona, Pa. In July, 1937, he was transferred to the office of the vice-president, operation, at Philadelphia, Pa., and in March, 1938, he was advanced to division engineer of the Long Island railroad, with headquarters at Jamaica, N. Y., the position he held until his recent promotion, which was effective April 11.

James P. Newell, Jr.

Harold G. Wood, acting trainmaster of the Southern Kansas division of the Atchison, Topeka & Santa Fe at Chanute, Kan., and an engineer by training and experience, has been promoted to trainmaster at that point. Mr. Wood was born at Emporia, Kan., on September 19, 1907, and was graduated in civil engineering from Kansas State Agricultural College in 1929. He first entered railway service in 1925, and served during summer vacations between terms of school as a timekeeper, chainman and track laborer on the Santa Fe in Kansas. On June 3, 1929, following his graduation from college, he was appointed a chainman at Emporia, Kan., and on February 1, 1930, he was promoted to rodman. Six weeks later, he was advanced to transitman at Newton, Kan., and on November 1, 1930, he was appointed rodman at that point. On September 1, 1931, Mr. Wood was appointed a chainman and on June 5, 1932, he was appointed an extra gang laborer on the Middle division, later serving as a section laborer at Topeka, Kan. On September 10, 1933, he left railway service to go with the Kansas State Highway Department, but returned to the Santa Fe on July 29, 1935, as a transitman at Marceline, Mo. Mr. Wood was promoted to roadmaster at Ottawa, Kan., on September 1, 1936, and on October 24, 1938, he was transferred to Chillicothe, Ill. On July 1, 1939, he was appointed transportation inspector at Topeka, and on January 1, 1940, he was advanced to acting trainmaster at Chanute. His promotion to trainmaster was effective May 5.

Frank D. Beale, assistant general superintendent on the Chesapeake & Ohio, with headquarters at Huntingdon, W. Va., and an engineer by training and experience, has been promoted to assistant vice-president—assistant to the president of the Chesapeake & Ohio, with headquarters at Cleveland, Ohio. Mr. Beale was born at Fredericksburg, Va., on November 4, 1890, attended Fredericksburg College and graduated in civil engineering from the University of Virginia in 1915. From July, 1908, to January, 1910, he was employed by the U. S. Government as a rodman, and on the latter date he entered railway service as an instrumentman on the Florida Railway (now abandoned), later becoming an assistant engineer. He left railway service to attend the University of Virginia, and, following graduation, entered the service of the C. & O. in October, 1915, as an assistant section foreman. In August, 1916, he was promoted to assistant supervisor of track and later was appointed acting division engineer of the Clifton Forge division. In May, 1917, he was promoted to division engineer of that division, with headquarters at Clifton Forge, Va. During the war Mr. Beale served with the 314th field artillery, returning to his former position on the C. & O. in July, 1919. In February, 1924, he was promoted to trainmaster on the Richmond division, and later served as trainmaster at Clifton Forge and superintendent of the Richmond division. On May 1, 1930, he was promoted to assistant general superintendent, with headquarters at Huntingdon, W. Va.

G. R. Haworth, engineer maintenance of way of the Western Maryland, has been appointed general superintendent, with headquarters as before at Baltimore, Md. Mr. Haworth, a native of Philipsburg, Pa., entered railway service in June, 1905, and after brief service on two small roads, he went with the Erie as a rodman at Hornell, N. Y., in 1907. Later in 1907, he worked as a levelman for the city surveyor in New York, and as recorder in the marine survey and dredging department in New York. In 1908, he returned to the Erie as concrete inspector at Cuba, N. Y. During 1909, Mr. Haworth was employed as a foreman in the state highway construction department, with headquarters at Pittsburgh, Pa., and as a levelman on the Chicago, Burlington & Quincy. He was appointed transitman in 1910, in charge of a field party, and later in that year he was employed as a surveyor for the United States Engineers. In 1911 he was successively instrumentman for the Western Maryland in West Virginia and a resident engineer, with headquarters at Hagerstown, Md. He was transferred to Baltimore in 1912 and in 1914 he was employed as an engineer on the construction of the Johns Hopkins Engineering School. Later in the same year Mr. Haworth returned to the Western Maryland as a resident engineer. In 1924 he was promoted to division engineer, with headquarters at Cumberland, Md., and in 1936

G. R. Haworth

he was advanced to engineer maintenance of way at Baltimore, the position he held at the time of his recent appointment.

Engineering

R. E. Knapp, roadmaster on the Atchison, Topeka & Santa Fe, with headquarters at La Junta, Colo., has been promoted to division engineer, with headquarters at Las Vegas, N. M., succeeding **R. G. Whyman,** who resigned on May 1.

H. P. Lessler, whose appointment as assistant roadmaster on the Denver & Rio Grande Western at Grand Junction, Colo., was announced in the March issue, has returned to his former position as office engineer at Pueblo, Colo.

H. M. Booth, roadmaster on the St. Louis-San Francisco at Amory, Miss., has been promoted to engineer-roadmaster, with headquarters at Ft. Worth, Tex., succeeding **T. E. Bliss,** division engineer, who has been transferred to Chaffee, Mo., replacing **H. F. Busch.** Mr. Busch has been transferred to Memphis, Tenn., relieving **G. W. Koontz.**

Laurence V. Johnson, assistant engineer on the Minneapolis, St. Paul & Sault Ste. Marie, with headquarters at Minneapolis, Minn., has been promoted to maintenance engineer, with the same headquarters, succeeding **E. G. Whitman,** whose appointment as transportation assistant is announced elsewhere in these columns. Mr. Johnson was born at St. Paul, Minn., on April 26, 1906, and attended the University of Minnesota. He entered railway service on the Soo Line in 1928, serving as chief draftsman and later as assistant engineer at Minneapolis, the position he held until his recent promotion, which was effective May 1.

M. C. Bitner, whose promotion to assistant division engineer on the Pennsylvania, with headquarters at Jersey City, N. J., was announced in the May issue of *Railway Engineering and Maintenance*, is a native of DuBois, Pa., and was born on January 31, 1900. He was educated at the Carnegie Institute of Technology from which he was graduated in civil engineering in 1925. He first entered railway service on May 1, 1926, as an assistant on the engineer corps of the Panhandle division of the Pennsylvania, being promoted to assistant supervisor of track on the Renovo division at Kane, Pa., on May 1, 1928. In January of the following year, he was transferred to the Panhandle division, with headquarters at Dennison, Ohio. On April 1, 1930, he was further advanced to supervisor of track, which position he held at various points until his recent promotion to assistant division engineer.

A. O. Wolff, acting district engineer of the Canadian Pacific, with headquarters at Saint John, N. B., has been appointed district engineer, succeeding **C. C. Kirby,** who retired on March 31. Mr. Kirby was born on March 8, 1880, at Newport, Monmouth, England, and came to Canada in 1907. He entered railway service in June, 1907, as an instrumentman on the Grand Trunk (now Canadian National). He was out of railway service from June, 1908, until April, 1909, and on the latter date he became a transitman on the Canadian Pacific. Mr. Kirby was appointed resident engineer, with headquarters at Montreal, Que., in May, 1910, and in February, 1912, became resident engineer, Montreal Terminals. He was appointed assistant engineer at Montreal in January, 1913, and held this position until January 1, 1916, when he was promoted to division engineer, with headquarters at St. John, later becoming district engineer at that point.

P. M. Roeper, whose promotion to division engineer on the Pennsylvania, with headquarters at Erie, Pa., was announced in the May issue, was born on June 19, 1904, and was educated at Carnegie Institute of Technology, graduating in 1928. He entered railway service with the Pennsylvania on June 13 of the same year as an assistant on the engineer corps of the Philadelphia division, with headquarters at Middletown, Pa. In November of that year he was promoted to assistant supervisor of track on the Williamsport division, with headquarters at Millersburg, Pa., later serving in the same capacity on the Middle and Maryland divisions. In

P. M. Roeper

February, 1930, Mr. Roeper was advanced to supervisor of track, serving in this capacity at Sunbury, Pa., on the Sunbury division, and at several other points. On April 1, 1939, he was promoted to assistant division engineer of the New York division, with headquarters at Jersey City, N.J., where he was located at the time of his recent promotion to division engineer.

Burton R. Leffler, engineer of bridges of the Lines West of Buffalo and the Ohio Central lines of the New York Central, with headquarters at Cleveland, Ohio, has retired, and **John B. Hunley,** engineer of bridges and structures of the Cleveland, Cincinnati, Chicago & St. Louis (Big Four), with headquarters at Cincinnati, Ohio, has been appointed engineer of structures on the New York Central system, with headquarters at Chicago, and his duties have been extended to include jurisdiction over the Erie, Cleveland, Toledo, Western, Ohio Central, Canada, Detroit, Michigan and West divisions in addition to his jurisdiction on the Big Four. **George E. Robinson,** assistant engineer at Cincinnati, has been promoted to assistant engineer of structures on the New York Central system, with headquarters at Cincinnati. **V. K. Hoffner,** office engineer on the New York Central at Cleveland, Ohio, has been promoted to assistant engineer of structures, with the same headquarters. The position of engineer of bridges, with headquarters at Cleveland, has been abolished.

Burton R. Leffler

Mr. Leffler was born at Naperville, Ill., on April 30, 1870, and attended Northwestern College at Naperville and the University of Illinois. He entered railway service on January 16, 1899, as an instrumentman on construction on the Chicago, Burlington & Quincy. On February 1, 1902, he went with the American Bridge Company as a structural draftsman and in May, 1903, he returned to railroad service as chief draftsman in the bridge department of the Lake Shore & Michigan Southern (now part of the New York Central system). In January, 1906, he was promoted to engineer of bridges and structures, with headquarters at Cleveland, and in January, 1915, when the New York Central absorbed the L. S. & M. S., he was appointed engineer of bridges and structures of the Lines West of Buffalo, with the same headquarters.

Mr. Hunley was born at Terre Haute,

John B. Hunley

Ind., on August 12, 1881, and was graduated from the Rose Polytechnic Institute in 1903. In May, 1903, he entered railway service as an assistant engineer in the construction department of the Big Four and in 1905, he was promoted to assistant engineer in the chief engineer's office, later being advanced to office engineer. In

1905, he was promoted to engineer of bridges and structures of the Big Four, with headquarters at Cincinnati, Ohio, the position he held until his recent promotion. For many years Mr. Hunley has been active in the work of the American Railway Engineering Association, serving as a director of that organization from 1937 to 1940 and as chairman of the special committee on Impact since March, 1937. Outstanding in his work with the A. R. E. A., is the monograph on Impact on Steel Bridges, published by that organization in its bulletin for October, 1935.

Mr. Robinson was born at Lowell, Mass., on March 5, 1896, and was graduated in civil engineering from Worcester Polytechnic Institute in 1917. He entered railway service on August 24, 1917, in the chief engineer's office of the Big Four at Cincinnati, and on October 23, 1917, he went with the U. S. Army, serving as a captain in the Engineering Corps. He returned to the Big Four on July 27, 1920, as a draftsman in the chief engineer's office, and a few weeks later he was promoted to assistant engineer of the Cincinnati-Sandusky division, with headquarters at Springfield, Ohio. Mr. Robinson

George E. Robinson

was transferred to the P. & E. division at Indianapolis, Ind., on September 19, 1921, and on December 5, 1921, he was appointed a bridge designer in the chief engineer's office. On May 16, 1923, he was appointed assistant engineer of the Indianapolis Terminal division, with headquarters at Indianapolis, and on June 18, 1924, he was reappointed bridge designer in the chief engineer's office. Mr. Robinson was promoted to assistant engineer on April 12, 1926, the position he held until his recent promotion.

Track

J. Sewell, roadmaster on the Canadian Pacific at Wilkie, Sask., has retired because of ill health, and the position of roadmaster at that point has been abolished.

M. P. Bogich, a track supervisor on the Wymore division of the Chicago, Burlington & Quincy, has been promoted to roadmaster, with headquarters at Edgar, Neb., succeeding **H. L. Stein,** who has retired. **G. E. Armstrong,** a track supervisor on the Lincoln division, has been promoted to roadmaster, with headquarters at Curtis, Neb., relieving **J. Pickrel,** who has been assigned to other duties.

E. G. Adams, supervisor of track on the Maryland division of the Pennsylvania, with headquarters at York, Pa., has been transferred to special duty in the office of the vice-president and comptroller at Philadelphia, Pa.

R. B. Grier, assistant cost engineer on the Cincinnati division of the Chesapeake & Ohio, has been promoted to supervisor of track of the Piney branches, with headquarters at Raleigh, W. Va., to succeed **W. J. Hedrick,** who has retired.

R. C. Mathews, roadmaster on the Atchison, Topeka & Santa Fe at Syracuse, Kan., has been transferred to La Junta, Colo., relieving **R. E. Knapp,** whose promotion to division engineer at Las Vegas, N. M., is announced elsewhere in these columns. The position of roadmaster at Syracuse has been abolished.

J. M. Bishop, roadmaster of the St. Louis, San Francisco & Texas, with headquarters at Ft. Worth, Tex., has been appointed roadmaster on the St. Louis-San Francisco, with headquarters at Amory, Miss., succeeding **H. M. Booth,** whose promotion to engineer-roadmaster, with headquarters at Ft. Worth, is announced elsewhere in these columns.

Glenn William Davis, whose promotion to track supervisor on the Illinois Central, with headquarters at Reevesville, Ill., was announced in the May issue, was born at Effingham, Ill., on February 7, 1903, and entered railway service on May 22, 1922, as a section laborer on the Illinois Central. On February 23, 1923, he was promoted to assistant foreman and on April 1, 1927, he was advanced to section foreman, the position he held until his recent promotion.

Leroy D. Shoda, whose promotion to track supervisor on the Logansport division of the Pennsylvania, with headquarters at Logansport, Ind., was announced in the May issue, was born at Columbia City, Ind., on April 17, 1888, and entered railway service on October 2, 1905, as a trackman on the Ft. Wayne division of the Pennsylvania. On April 1, 1913, he was promoted to extra gang foreman and on February 1, 1937, he was advanced to general foreman of the Butler branch. Mr. Shoda was later advanced to acting supervisor. His appointment as track supervisor was effective April 1.

Albert L. Kickhafer, whose retirement as roadmaster on the Chicago & North Western, with headquarters at Ironwood, Mich., was announced in the May issue, was born in Jackson, Wis., on April 21, 1875. He entered railway service at the age of 15 as a section laborer on the North Western at Hortonville, Wis., and transferred to the Ashland division on June 6, 1896, as an extra gang laborer. On August 1, 1902, Mr. Kickhafer was promoted to assistant extra gang foreman and on June 1, 1906, he was advanced to extra gang foreman. On January 1, 1909, he was promoted to roadmaster at Ironwood, the position he held until his retirement on April 30.

Frank G. Murphy, whose retirement as track supervisor on the Illinois Central, with headquarters at Bloomington, Ind., was announced in the May issue, was born at Emery, Ill., and entered railway service on April 1, 1896, as a section laborer on the Toledo, St. Louis & Western (now part of the Nickel Plate). On May 1, 1900, he was promoted to section foreman, and on April 1, 1908, he went with the Cleveland, Cincinnati, Chicago & St. Louis (Big Four) as section foreman at Coal Bluff, Ind. Mr. Murphy was transferred to Terre Haute, Ind., as yard foreman on April 1, 1911, and on September 8, 1914, he went with the Illinois Central as an extra gang foreman at Mattoon, Ill. On April 1, 1915, he was transferred to Mt. Pulaski, Ill., as section and extra gang foreman and on September 1, 1916, he was transferred to Mattoon as yard foreman. Mr. Murphy was promoted to track supervisor, with headquarters at Bloomington, Ind., on November 1, 1918, the position he held until his retirement.

W. A. Smith, assistant supervisor of track on the New York Central at Elkhart, Ind., has been promoted to supervisor of track, with headquarters at Kenton, Ohio, succeeding **J. Prybylski,** who has been transferred to Silver Creek, N. Y. Mr. Prybylski relieved **Edward P. Safford,** who has retired.

Mr. Safford was born at Redwood, N.Y., on April 8, 1870, and graduated in engineering from Michigan State University in 1891. He entered railway service on March 22, 1892, as a rodman on the Lake Shore & Michigan Southern (now part of the New York Central system), at Toledo, Ohio. In June, 1893, he was appointed clerk to the roadmaster at La Porte, Ind., and later served in that capacity at Elkhart, Ind., and Kendallville. On January 1, 1900, he was promoted to roadmaster at Kalamazoo, Mich., later serving at White Pigeon, Mich., Hillsdale, Mich., Alliance, Ohio, and Adrian, Mich. Mr. Safford was transferred to Silver Creek, N. Y., in May, 1920, and later his title was changed to supervisor of tracks, with the same headquarters, the position he held until his retirement on April 8.

John L. Gallavan, whose retirement on March 1, 1940, as general roadmaster on the Union Pacific, with headquarters at Denver, Colo., was announced in the April issue, was born at Munfordville, Ky., on May 12, 1870, and attended college one year at St. Paul, Kan. He entered railway service on April 1, 1883, as a water boy on the Southern Kansas (now part of the Atchison, Topeka & Santa Fe) at Independence, Kan., later working on the section in the summers between terms of school. On February 27, 1887, he became a regular section laborer on the Denver, Memphis & Atlantic (now part of the Missouri Pacific) at Sedan, Kan. On April 1, 1897, he went with the Union Pacific as a section foreman, later serving also as an extra gang foreman. On August 1, 1904, he was promoted to roadmaster, and served in this capacity at various points. Mr. Gallavan was promoted to general roadmaster, with headquarters at Kansas City, Mo., on November 3, 1915, and on May 1, 1919, he was

transferred to Denver, where he remained until his retirement.

Owen H. Carpenter, whose promotion to general roadmaster on the Union Pacific, with headquarters at Pocatello, Idaho, was announced in the April issue, was born at Richmond, Ky., on September 14, 1900, and entered railway service on April 28, 1921, as a section man on the Nebraska division of the Union Pacific at Darr, Neb. On July 31, 1924, he was promoted to section foreman on the Nebraska division, later being appointed assistant foreman and then re-appointed section foreman. On November 16, 1927, he was promoted to acting roadmaster, and on July 15, 1929, he was advanced to roadmaster, serving in that capacity on the Nebraska, Wyoming and Western divisions until January 1, 1937, when he was promoted to general roadmaster of the Wyoming division, with headquarters at Cheyenne, Wyo. On August 1, 1939, Mr. Carpenter was appointed roadmaster at Rawlins, Wyo., and on March 1, 1940, he was transferred to Evanston, Wyo., where he was located at the time of his recent promotion.

G. A. McRoberts, supervisor of bridges and buildings on the Southern at Lexington, Ky., has been appointed assistant roadmaster at Hattiesburg, Miss., succeeding **T. Crawford,** who has been promoted to roadmaster at Somerset, Ky., relieving **M. W. Self,** who retired on April 30. **Clarence E. Price,** assistant roadmaster at Louisville, Ky., has been promoted to roadmaster, with the same headquarters, and **W. C. Morris,** track supervisor at Birmingham, Ala., has been promoted to assistant roadmaster at Louisville, replacing Mr. Price. **L. B. Craig,** track supervisor at Princeton, Ind., has been transferred to Birmingham, relieving Mr. Morris, and **J. B. Singleton,** assistant supervisor at Louisville, has been advanced to track supervisor, with headquarters at Princeton, succeeding Mr. Craig. **W. C. Johnson,** student apprentice, has been promoted to assistant supervisor at Louisville, replacing Mr. Singleton.

Mr. Crawford was born at Fuller, Miss., on January 28, 1894, and attended Louisiana Polytechnical Institute. He entered railway service on June 15, 1915, as a rodman on the Gulf, Mobile & Northern, and on December 1, 1915, he went with the Southern as a rodman at New Orleans, La. On September 15, 1917, he was advanced to instrumentman and on January 1, 1919, he was appointed junior engineer at Chattanooga, Tenn. On April 1, 1920, he was transferred to Macon, Ga., and on May 1, 1924, he was promoted to assistant engineer. Mr. Crawford was transferred to Chattanooga, on September 1, 1931, and on January 1, 1933, he was promoted to supervisor of bridges and buildings. On October 1, 1934, he was appointed supervisor of bridges and buildings and tracks at New Orleans, and on August 15, 1937, he was appointed assistant roadmaster at Louisville, being transferred to Hattiesburg on March 1, 1939.

Mr. Price was born at Toomsuba, Miss., on December 22, 1896, and entered railway service on the Southern on July 15, 1913, as an apprentice foreman, later serving as an assistant foreman, extra gang foreman and a section foreman until the World War when he served in the Navy. After the war he returned to the Southern as a section foreman and in March, 1924, he was advanced to track supervisor at Chattanooga, Tenn. Mr. Price was transferred to the Birmingham Terminals, Birmingham, Ala., in June, 1936, and on March 1, 1939, he was advanced to assistant roadmaster at Louisville, Ky., the position he held at the time of his recent promotion, which was effective May 1.

Bridge and Building

L. D. Beatty, roadmaster on the Southern at Princeton, Ind., has been appointed supervisor of bridges and buildings, with the same headquarters, succeeding **E. H. Nutt,** who has been transferred to Louisville, Ky. Mr. Nutt replaces **J. R. Kelly,** who has been transferred to Lexington, Ky., relieving **G. A. McRoberts,** whose appointment as assistant roadmaster at Hattiesburg, Miss., is announced elsewhere in these columns.

F. R. Benedict, bridge and building foreman on the Union Pacific, has been promoted to supervisor of bridges and buildings, with headquarters at Cheyenne, Wyo., succeeding **Elias C. Clausen,** who has retired. Mr. Clausen was born at Aarhus, Denmark, on April 5, 1870, and attended Odder Technical College in Denmark from 1886 to 1890. In May, 1890, he entered railway service as a laborer on the Union Pacific and in 1894, he was advanced to carpenter. In September, 1899, he was promoted to carpenter foreman, and later to general construction foreman. Mr. Clausen was advanced to supervisor of bridges and buildings of the Nebraska division, with headquarters at Omaha, Neb., in 1916, and the following year he was transferred to the Wyoming division, with headquarters at Cheyenne, where he remained until his retirement on April 30.

Alma Earnest Causey, whose promotion to master carpenter on the Chicago, Rock Island & Pacific, with headquarters at Dalhart, Tex., was announced in the May issue of *Railway Engineering and Maintenance,* was born at Woodford, Okla., on May 10, 1896, and completed a correspondence course in engineering. On January 5, 1915, he entered railway service on valuation survey work for the Interstate Commerce Commission and on November 15, 1915, he entered the service of the Atchison, Topeka & Santa Fe as a chainman at Amarillo, Tex., later becoming a rodman. From July 8, 1916, to December 15, 1917, he served as a chainman on I. C. C. valuation survey work. On December 17, 1917, he joined the U. S. Army, Air Service, and served in France, later being promoted to sergeant. He returned to I. C. C. valuation survey work as a chainman in September, 1919, and on November 3, 1919, he went with the Rock Island as a rodman at El Reno, Okla. Mr. Causey was promoted to instrumentman in April, 1920, and on November 15, 1921, he was advanced to assistant engineer at Dalhart. On April 22, 1929, he was promoted to master carpenter, with headquarters at Dalhart, and on July 1, 1932, he was re-appointed assistant engineer at that point. On January 1, 1933, Mr. Causey was appointed track supervisor at Dalhart, and on April 1, 1933, he was re-appointed assistant engineer at that point. On November 2, 1935, he was promoted to roadmaster, with headquarters at Amarillo, Tex., the position he held until his recent promotion.

Special

Richard E. Sampson, general welding foreman of the Boston & Maine, has been promoted to supervisor of welding, with headquarters at Boston, Mass.

Obituary

Emil H. Pfafflin, who retired on September 30, 1937, as assistant division engineer of the Chicago, Milwaukee, St. Paul & Pacific, with headquarters at Terre Haute, Ind., died on May 3 in Chicago. He was born on June 17, 1862, and entered railway service in 1888 as a locating engineer for the Evansville & Richmond (now a part of the C. M. St. P. & P.). In 1889 he was promoted to resident engineer, and in 1891 he entered the employ of the Evansville & Terre Haute (now a part of the C. & E. I.). In 1904, he was appointed chief engineer of the Chicago Southern which later became the Chicago Terre Haute & Southeastern and which is now a part of the Milwaukee. Mr. Pfafflin held this position until 1921 when he was made district engineer of the Milwaukee at Terre Haute. He was appointed assistant division engineer in 1932. He was a charter member of the American Railway Engineering Association.

Henry T. Ross, assistant engineer of the Saskatoon district of the Canadian National, who was promoted recently to division engineer of the Prince Albert division, with headquarters at Prince Albert, Sask., succeeding **Gilbert Murray,** who died on January 23, died in the City hospital at Saskatoon, Sask., on May 13, following a major operation.

Mr. Ross was born in Penang, Straits Settlements, on March 19, 1886, and was educated in Scotland, coming to Canada in July, 1906, as a draftsman for the National Transcontinental (now part of the Canadian National). He later served as instrumentman, resident engineer on construction, designing engineer, and assistant engineer of maintenance and on February 15, he was promoted to division engineer at Prince Albert, the position he held at the time of his death.

Mr. Murray was born at Boston, Mass., on March 16, 1883, and after serving as a rodman and instrumentman for a consulting engineering firm in Boston and as engineer and inspector for the town of Sydney, N. S., entered railway service in 1904 as a draftsman on the Grand Trunk Pacific (now part of the Canadian National system) in Alberta. He later served as a resident engineer and locating engineer in Alberta and British Columbia and in 1918 he was appointed assistant division engineer in Saskatchewan, later serving as assistant division engineer and roadmaster, with headquarters at Melville, Sask. On October 1, 1938, he was advanced to division engineer at Prince Albert, Saskatchewan.

Continued on page 406

NEW RACOR

Style 3911, for high stands sectional view showing engagement of treadle in lock rod and strong rust proofed spring.

ANNOUNCEMENT

Rapro Switch Locks now made by RAMAPO AJAX.

The Ramapo Ajax Division of The American Brake Shoe and Foundry Company has taken over both manufacture and distribution of the Rapro Switch Lock, as formerly manufactured by Railroad Products Company of Cincinnati, Ohio.

RACOR

RAMAPO

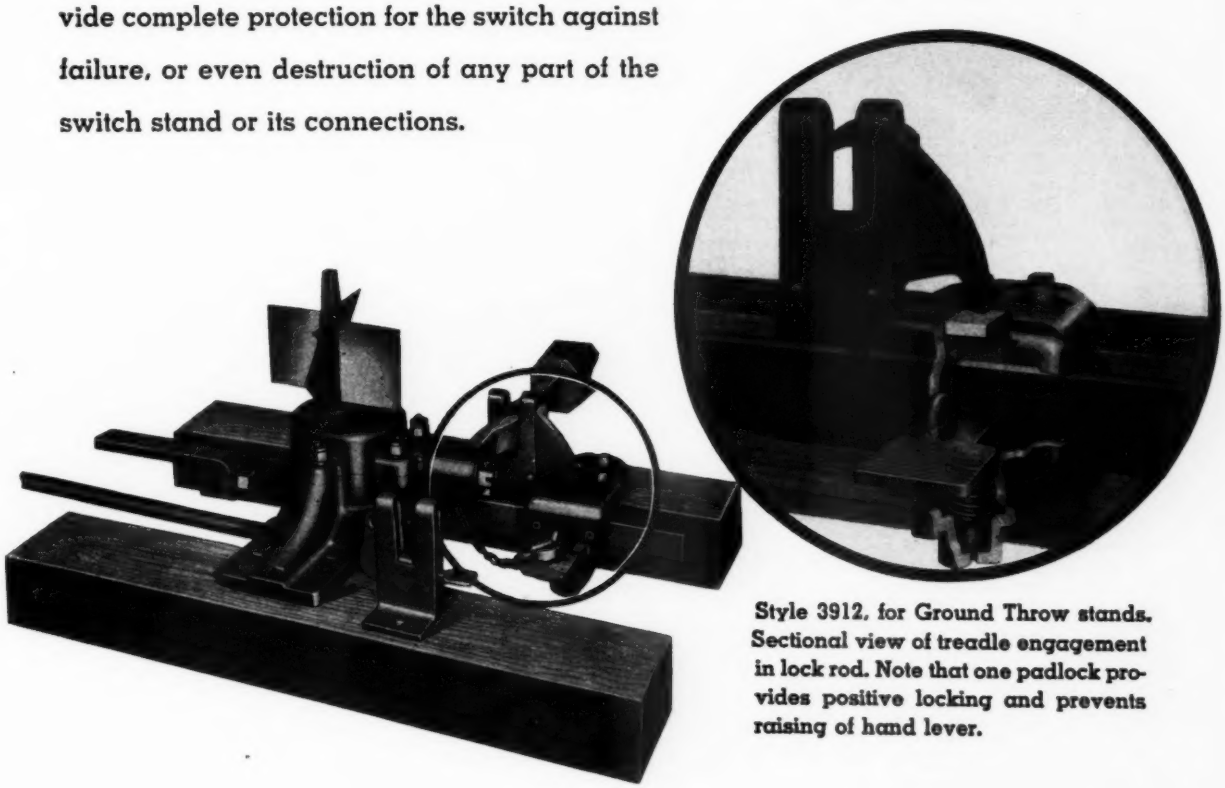
SWITCH POINT LOCK

SAFE – COMPACT – EXTRA HEAVY

Located below the top of the tie, the mechanism of the new Racor Switch Lock is entirely separate from the stand and completely protected. Even if the stand is knocked down, the lock will still function.

Furthermore, the locking rod clamps directly to the switch point and the padlock cannot be inserted unless the switch is properly closed.

These two features, together with the extra-heavy construction, provide complete protection for the switch against failure, or even destruction of any part of the switch stand or its connections.



Style 3912, for Ground Throw stands. Sectional view of treadle engagement in lock rod. Note that one padlock provides positive locking and prevents raising of hand lever.

AJAX DIVISION OF

THE AMERICAN BRAKE SHOE AND FOUNDRY COMPANY

Association News

Roadmasters Association

President G. L. Sitton has called a meeting of the Executive Committee and the chairmen of technical committees in Chicago on June 8, to develop plans for the convention next September and to review the reports of committees that are to be presented at that convention.

Metropolitan Maintenance of Way Club

The club will hold its annual outing at the Houvenkopf Country Club, Suffern, N. Y., on June 27. It was planned originally to hold this function on June 20, but it became necessary to make the change to avoid conflict with the annual outing of the New York Railroad Club. As in past years, the program for the day will include golf and other sports, and a luncheon at noon.

American Railway Engineering Association

In accordance with action taken by the Board of Direction at its meeting on March 11, the secretary's office is issuing life membership certificates to all life members of the association, of whom there are 136. The 1940 Proceedings, reporting the activities of the convention last March, are now in the hands of the printer, and this volume will be made available to members late in June. It will contain 1046 pages, compared with 803 pages included in the 1939 Proceedings.

Nine committees of the association have scheduled meetings for June as follows: Stresses in Track, at Chicago, on June 4; Track, at Chicago, on June 6; Wood Bridges and Trestles, at Chicago, on June 6; Roadway and Ballast, at Ashland, Ky., on June 6-7; Rules and Organization, at New Haven, Conn., on June 7; Economics of Railway Location and Operation, at Cleveland, Ohio, on June 20-21; Buildings, at New York, on June 25-26; Highways on June 26 and Water Service, Fire Protection and Sanitation on June 27 at Chicago.

Four committees held meetings in May, these being the Committee on Rail, at Chicago, on May 7; Records and Accounts, at Detroit, Mich., on May 8; Iron and Steel Structures, at Columbus, Ohio, on May 9-10; and Co-operative Relations with Universities, at Columbus, Ohio, on May 24.

Railway Tie Association

The Railway Tie Association met at Louisville, Ky., on May 14, with approximately 75 tie producers and railway officers present. Reports were presented on The Checking and Splitting of Ties, Standard Adzing and Boring, Timber Conservation, Changes in Dimensions of Crossties During the Seasoning Period, Manufacturing Practice, Moisture Gradient as a Determining Factor in the Treatment of Crossties, Specifications and Inspection, and Statistics. G. O. Beale, chief purchasing and stores officer of the Chesapeake & Ohio, addressed the group.

The following officers were elected for the ensuing year: President, Leonard Perez, The Wood Preserving Corporation, St. Louis, Mo.; first vice-president, H. C. Woolf, The Bond Woolf Tie Company, Alcoa, Tenn.; second vice-president, T. Robinson, Southern Wood Preserving Company, Atlanta, Ga.; secretary-treasurer, Roy Edmonds (re-elected), St. Louis, Mo.; members Executive Committee, R. H. Hamilton, T. J. Moss Tie Company, St. Louis, Mo.; J. H. Tabb, The Tabb Tie Company, Houston, Tex.; D. W. Bauer, The Potosi Tie & Lumber Co., St. Louis, Mo.; T. J. Turley, Jr., Bond Brothers, Louisville, Ky.; Walter Firman, The Wyoming Tie & Timber Co., Metropolis, Ill.

Track Supply Association

Forty-five companies, manufacturing and selling equipment and materials of interest to the maintenance of way departments of the railways, have already made application for 64 spaces at the annual exhibit of the association, to be held in the Hotel Stevens, Chicago, September 9-12, in conjunction with the anual convention of the Roadmasters' and Maintenance of Way Association. This number of companies, and the amount of space reserved by them, represents more than double the reservations received to this date a year ago. Further applications should be addressed to Lewis Thomas, secretary-treasurer, Track Supply Association, 59 East Van Buren street, Chicago.

The companies that have made application for space to date include:

Air Reduction Sales Company, New York
American Fork & Hoe Co., Cleveland, Ohio
Barco Manufacturing Company, Chicago
Buda Company, Harvey, Ill.
Chipman Chemical Company, Bound Brook, N. J.
Creepcheck Co., Inc., New York
Crerar, Adams & Co., Chicago
Cullen-Friestedt Company, Chicago
DeSanno & Son, Inc., A. P., Philadelphia, Pa.
Duff-Norton Manufacturing Co., Pittsburgh, Pa.
Eagle Grinding Wheel Company, Chicago
Elastic Rail Spike Corporation, New York
Electric Tamper & Equipment Co., Ludington, Mich.
Fairmont Railway Motors, Inc., Fairmont, Minn.
Gary Screw & Bolt Co., Chicago
Illinois Malleable Iron Company, Chicago
Jacobsen Manufacturing Company, Racine, Wis.
Jordan Company, O. F., East Chicago, Ind.
Kalamazoo Railway Supply Co., Kalamazoo, Mich.
Link-Belt-Speeder Corporation, Chicago
Lundie Engineering Corporation, New York
Maintenance Equipment Company, Chicago
Mall Tool Company, Chicago
Metal & Thermit Corporation, New York
Morden Frog & Crossing Works, Chicago
Nordberg Manufacturing Co., Milwaukee, Wis.
Northwestern Motor Company, Eau Claire, Wis.
Oxweld Railroad Service Company, Chicago
P. & M. Company, The, Chicago
Pettibone Mulliken Corporation, Chicago
Pocket List of Railroad Officials, New York
Positive Rail Anchor Company, Chicago
Power Ballaster Company, Chicago
Q. & C. Company, New York
Rail Joint Company, The, New York
Rails Company, New Haven, Conn.
Railway Engineering and Maintenance, Chicago
Railway Purchases and Stores, Chicago
Ramapo Ajax Div., American Brake Shoe & Foundry Co., Chicago
Railway Track-Work Company, Philadelphia, Pa.
Templeton, Kenly & Co., Chicago
Union Switch & Signal Co., Swissvale, Pa.
Warren Tool Corporation, Warren, Ohio
Woodings-Verona Tool Works, Verona, Pa.
Woolery Machine Company, Minneapolis, Minn.

Supply Trade News

General

The American Lumber & Treating Co. moved its offices and laboratory to 332 S. Michigan avenue, Chicago, on May 1.

The Timber Engineering Company of New England has been formed with offices at 422 Border street, Boston, Mass. This company, which is an affiliate of the Timber Engineering Company, Washington, D. C., has been organized to meet the demand in the New England area for information regarding the use of Teco connectors in timber construction.

Personal

J. L. McCaffrey, director of domestic and Canadian sales of the **International Harvester Company,** Chicago, has been promoted to vice-president in charge of domestic and Canadian sales to succeed **Charles R. Morrison,** retired.

Edward L. Ryerson, Jr., vice-chairman of the board of the **Inland Steel Company,** Chicago, has been elected chairman to succeed **L. E. Block,** who has retired. Mr. Block has been elected chairman of the executive committee.

Howard R. Murphy, manager of the tractor business of **Sears Roebuck & Company,** and formerly manager of the sales development division of the **Caterpillar Tractor Company,** Peoria, Ill., has been appointed sales manager of the central division of the latter company to succeed **C. M. Burdette,** resigned.

George A. Blackmore was elected chairman of the board of the **Duff-Norton Manufacturing Company,** Pittsburgh, Pa., at a recent meeting of its board of directors, succeeding the late **Thomas A. McGinley.** Mr. Blackmore is president and director of the Westinghouse Air Brake Company, the Union Switch & Signal Co., a director of the A. M. Byers Company, the Pittsburgh Screw & Bolt Corp., the Pittsburgh Coal Company, the Flannery Bolt Company, the Bendix-Westinghouse Automotive Brake Company, the Cardwell Westinghouse Company, the Westinghouse Brake & Signal Co., Ltd. of London, the Canadian-Westinghouse Company of Hamilton, Ont., the Westinghouse Electric & Manufacturing Company, the Mellon National Bank, the National Association of Manufacturers, and the Chamber of Commerce of Pittsburgh.

Chester H. Lang, manager of the **General Electric Company's** advertising and sales promotion activities since 1932, has been appointed manager of apparatus sales and vice-chairman of the company's Apparatus Sales Committee, and **Robert S. Peare** has been appointed manager of the publicity department. As advertising manager, and a member of both apparatus and appliance sales committees, Mr. Lang has been associated with all commercial activities of the company. He organized its market research bureau in 1932 devoted to sales analyses of existing and contem-

plated products. Mr. Lang was born at Erie, Pa., and was graduated from the University of Michigan. He entered the employ of the General Electric Company in 1919, as a traveling auditor, following

Chester H. Lang

his service as a first lieutenant in the field artillery overseas with the 35th division. In 1922 he was appointed assistant manager of the publicity department and in 1926, became comptroller of the budget, which position he held until 1932, when he became advertising manager. He also served as General Electric's manager of broadcasting, operating its various stations and while comptroller of the budget he devised a sales direction plan which has been an effective aid in the operation of the company's sales departments and field offices. He served for two years as president of the Advertising Federation of America, later as chairman of the board and is an active member of the Association of National Advertisers.

Obituary

Charles D. Batson, manager of the Mobile, Ala., plant of the Republic Creosoting Company, died in that city on May 7 after an extended illness.

E. J. Irving, vice-president of the National division of **The Wood Preserving Corporation,** Pittsburgh, Pa., with headquarters at Texarkana, Ark., died on April 4. Mr. Irving was born at Kingston, N. B., on May 17, 1870, and came to East Texas when a young man. He served for a time as tie and timber agent for the International Great Northern (part of the Missouri Pacific system) at Palestine, Tex., and later with the St. Louis Southwestern at Texarkana. During the World War, under the government adminisfration of the railroads, he served as chief regional inspector of all forest products. Mr. Irving joined the National Lumber & Creosoting Company (controlled by the Wood Preserving Corporation) in Texarkana in 1924, as assistant to the president, and in 1926 he was elected a vice-president.

Thomas A. McGinley, president and chairman of the board of the Duff-Norton Manufacturing Company, Pittsburgh, Pa., who died on April 13, as reported in the May issue, was graduated from Yale University in 1901. Soon afterward, he entered the employ of the Duff Manufacturing Company, and worked through its various departments up to the presidency and board chairmanship of its successor organization, The Duff-Norton Manufacturing Company. During his early manhood he, with his father, was interested in several of George Westinghouse's enterprises, and at his death Mr. McGinley was a director of the Westinghouse Air Brake Company and the Union Switch and Signal Company, as well as numerous other concerns, including the Pittsburgh Screw and Bolt Company, the Fidelity Trust Company and the Allegheny General Hospital. He was treasurer of the Eaglis Company. During the World

Thomas A. McGinley

War, Mr. McGinley served in New York as district manager in charge of aircraft production for the United States Army.

Trade Publications

Acidseal Paints—The B. F. Goodrich Company, Akron, Ohio, has published a four page catalog section No. 9770, descriptive of its line of Acidseal paints derived from rubber by a patented process. The qualities of these paints are described and the section includes directions for their application and suggestions for their use in many specialized cases where highly protective coatings are needed.

Creosoted Fence Posts—An eight-page booklet entitled, "Colonial Creosoted Fence Posts," has been published by the American Creosoting Company, Inc., Chicago, which describes the creosoted fence posts manufactured by this company, the method of their installation, and their advantages in long life and strength as compared to other types of fence posts. The booklet is attractively illustrated with photographs and drawings.

Arc-Welding Electrodes — A 40-page bulletin, GEA-1546F, prepared as a guide for the proper selection of electrodes for arc-welding work, has been published by the General Electric Company, Schenectady, N.Y. The bulletin gives important suggestions on welding technique with different types of electrodes and presents some of the factors influencing their choice. Complete descriptions are presentetl of the 20 types of General Electric electrodes, their applications, sizes, recommended currents, arc-voltages, and identification. The physical characteristics of deposited weld metal are explained and charts of joint forms and positions, and a table for estimating electrode quantities, are also included. The bulletin is attractively illustrated with numerous photographs and diagrams.

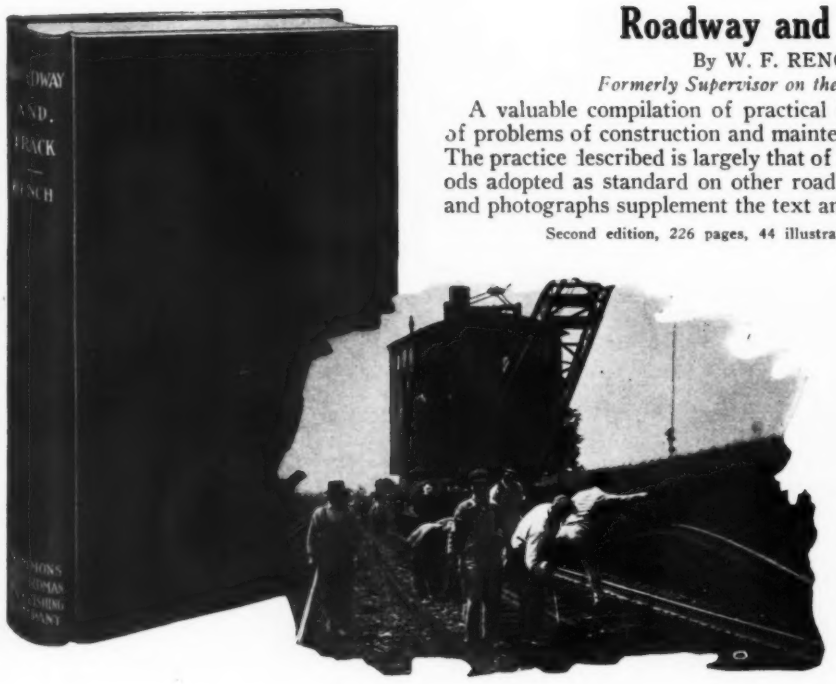
Whiting Cranes—A catalog with this title, describing the complete line of Whiting Tiger cranes, Gantry cranes and the structural features of their parts, has been published by the Whiting Corporation, Harvey, Ill. The catalog also explains how to select a crane and presents tables of average crane speeds and of dimensions and clearances. It is attractively illustrated with many photographs of various types of cranes in use, as well as photographs of the equipment and construction features.

Handbook of Building Maintenance—The Flexrock Company, Philadelphia, Pa., has published a new and completely revised 64-page edition of this illustrated handbook. In adition to general information pertaining to the maintenance of buildings, the handbook contains complete data regarding the uses, advantages and application of this company's products, which include floor repair and finishing materials, concrete admixtures for various purposes, compounds for hardening concrete surfaces, roofing materials and caulking compounds.

Manual of Timber Connector Construction—A revised edition of the publication bearing this name has just been made available by the Timber Engineering Company, Washington, D.C. This manual, which embodies 16 pages, contains design and load data for the different types of timber connectors. The present edition contains such information for three new types of connectors, namely the shear plate, the spike grid and the clamping plate. In addition, it is pointed out that the design data in the new edition incorporates the results of additional tests that were made to obtain base load information, thereby making possible certain refinements and economies in the design of timber joints with connectors. A table of dimensional properties of timbers furnishes necessary timber design information.

DeVilbiss Hose—An illustrated 24-page catalog containing full information on the complete line of various types of hose manufactured by the DeVilbiss Company, Toledo, Ohio, has been published by this company. The catalog describes the manufacture of DeVilbiss hose, beginning with baled crude rubber and continuing through the fatcory and testing laboratory to its final finished forms. Special types of hose, including spray-painting, air and fluid hose, welding and pneumatic tool hose, brake hose with solvent-resisting lining, service station, air, water and gasoline hose, are described and illustrated, and full specifications are listed with each type of hose illustrated, as well as much valuable information to aid in the selection of the right hose for a particular job. Also included is the complete line of hose connections, valves, couplings and adapters manufactured by this company.

Practical Books That Will Help Maintenance Men Do Better Work



Roadway and Track

By W. F. RENCH

Formerly Supervisor on the Pennsylvania

A valuable compilation of practical information on the solution of problems of construction and maintenance of roadbed and track. The practice described is largely that of the *Pennsylvania*, but methods adopted as standard on other roads are also given. Drawings and photographs supplement the text and there is a complete index.

Second edition, 226 pages, 44 illustrations, cloth, 6x9, $2.00

Simplified Curve and Switch Work

By W. F. RENCH

This little book has practically revolutionized curve and switch calculation practice since its appearance 15 years ago. The proved accuracy of its methods has caused them to be adopted as standard practice on many roads.

Complex algebraic and geometric calculations are reduced to their simplest form and as nearly as possible to terms of simple arithmetic. Application of these calculations to the actual job is made plain by brief explanations. Drawings further clarify the subject and make the meaning of the text unmistakable. Short cut formulae are featured. String lining and tape line layouts are fully explained. 212 pages, 24 illustrations, 5x7, cloth, $2.00.

Track and Turnout Engineering

By C. M. KURTZ

Engineer, Southern Pacific Company

This handbook for location, construction and maintenance of way engineers, transitmen and draftsmen, gives practical mathematical treatment of track layout and other problems. These are **fully exemplified** and worked out in detail, and illustrated with drawings of accepted designs for fixtures and track layouts. It contains original as well as a complete set of standard railway engineering handbook tables. All computing problems which may arise in track engineering are thoroughly treated by an engineer of 25 years' experience. 457 pages, 116 illustrations, 33 tables, flexible binding, 5x7 inches, $5.00.

Practical Trackwork

By W. F. RENCH

A handbook giving expert information on the design, fabrication and installation of standard trackwork. Thoroughly describes switch stands, switches, frogs, crossings and slip switches. 256 pages, 110 illustrations, tables, index, flexible binding, 5x7, $1.50.

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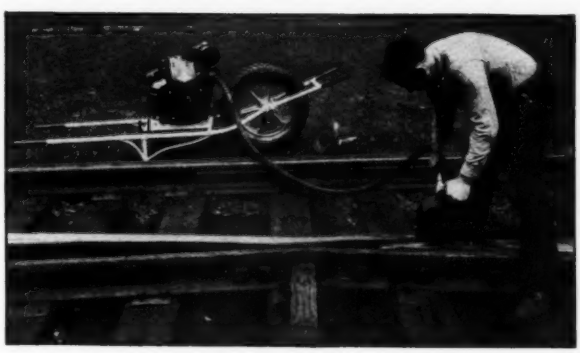

Railway Track-work Model P-22 Portable Flexible Shaft Grinder for free-hand grinding of surface welds, flange ways, switch points and stock rails. Auxiliary attachments include ball bearing hand piece for cup wheel, rocker arm type cross cutter for slotting joints, track drill, etc. The grinder, powered by 4 hp. air cooled gasoline engine or electric motor as desired, has in every respect demonstrated its ruggedness and efficiency on leading railways. Many other models available.

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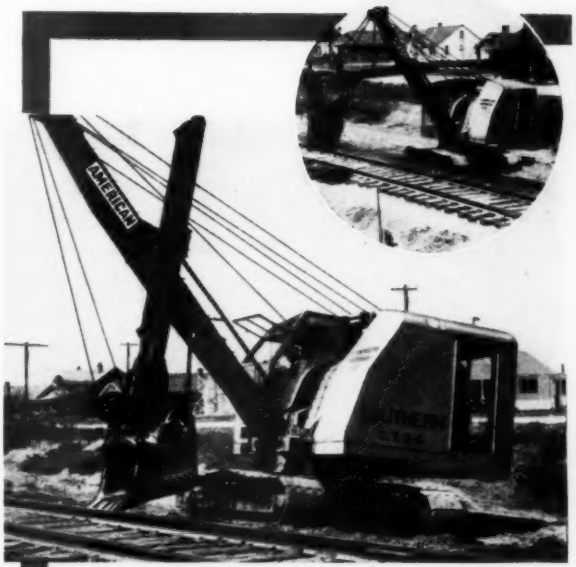

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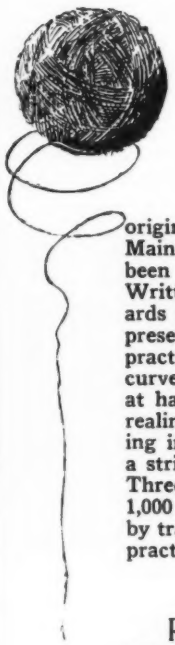

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Roads That Have Used The WOOLERY TIE CUTTER

are ordering additional units because they have found that these machines pay for themselves in a single season, or less.

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THE ELECTRICALLY DRIVEN HAND SHEARS

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Cuts Tie-Replacement Labor Cost in HALF!

Thorough tests under normal track maintenance conditions show that, when the New Duff-Norton Tie-Puller is used, tie replacement jobs are completed in half the time ordinarily required!

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Send for bulletin giving full information about the Duff-Norton Tie-Puller, or write for a sample to try out on your road.

THE DUFF-NORTON MANUFACTURING COMPANY
PITTSBURGH, PA.

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☐ We would be interested in testing a Duff-Norton Tie-Puller
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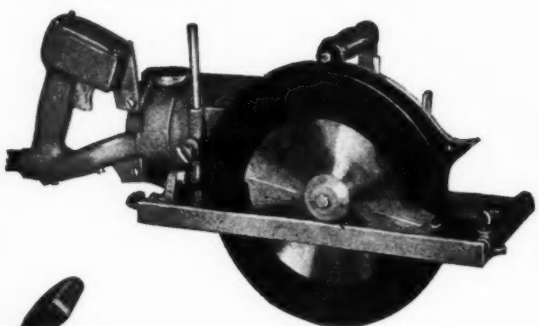

Concrete Vibrators

Stronger, denser, smoother concrete is assured by using Syntron High-Speed Vibrators when pouring into place. Types are available for either internal or external use—electric or gas-engine driven. Shown at the left is an Internal Type.

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290 Lexington Ave.
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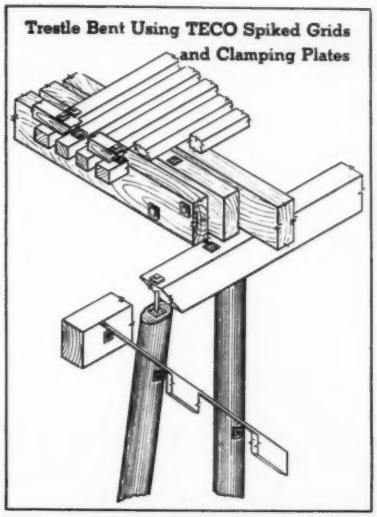
"The Most Important Type of Connector for Timber Trestle Construction is the Spike Grid"

—From A.R.E.A. Bulletin 415.

We illustrate here railway trestle bent using TECO Spike Grids and TECO Clamping Plates. Note use of Single Curve Grids between piles and sway brace and Flat Spike Grid between cap and sway brace. *Result—rigidity is increased about four times over that produced by a ¾" bolt, and dapping is eliminated.*

Trestle Bent Using TECO Spiked Grids and Clamping Plates



TECO Clamping Plates are used to fasten guard rail to ties and ties to stringers, *thus eliminating daps. A bolt is used on every third connection.* Note Clamping Plate also used between stringer and cap and between cap and end grain of pile. You too can make your timbers do more work at less cost.

Write for samples and prices.

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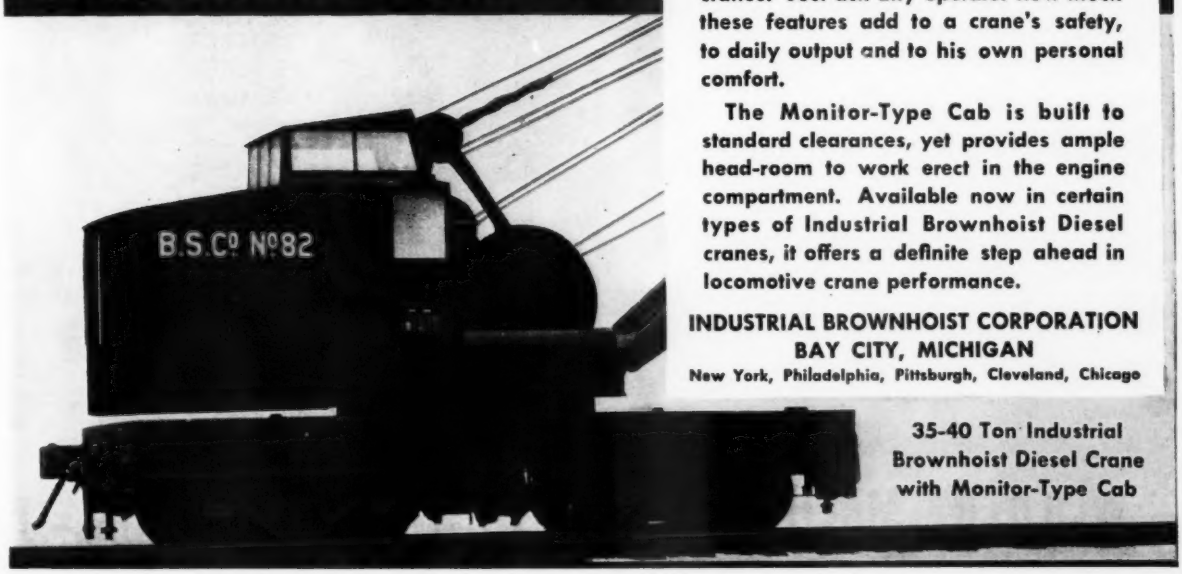
BY INDUSTRIAL BROWNHOIST



35-40 Ton Industrial Brownhoist Diesel Crane with Monitor-Type Cab

No other Diesel locomotive crane can match the complete 360° vision of the patented Monitor-Type Cab. For the first time, an operator can look out to the rear and sides of his cab as well as to the front; he can see both the tip and feet of the boom and, with it all, has perfect ventilation and less noise than on other cranes. Just ask any operator how much these features add to a crane's safety, to daily output and to his own personal comfort.

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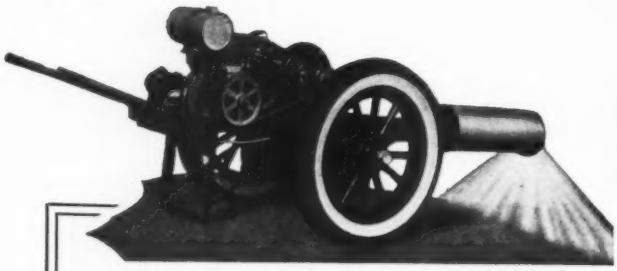
A New Unit



The WOOLERY "JUNIOR" WEED BURNER

The addition of this portable, off-track unit to the well known WOOLERY GIANT "Octopus" and MIDGET "Octopus" Weed Burners provides a *complete line* from which to choose for the most economical eradication of weeds—whether in main line, branch line or yard work—and about highway crossings, buildings and other places where weeds are obnoxious.

Designed for greatest flexibility in use, the "Junior" burner assembly can be lifted from the chassis and placed on a push car. Burning a swath 5-ft. wide, the entire tie area of the track can be burned over in a round trip of the car.

The "Junior" is equally efficient in melting snow and ice from switches, drainage pipes, culverts, hopper bottom cars, etc.

Make this year-around money saver a part of your work equipment. Write for Complete Information.

● ONE "JUNIOR" WEED BURNER on the job below would relieve all of these men for more productive work.

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MINNEAPOLIS, MINNESOTA

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WITH Mall TRADE MARK RAIL GRINDERS

Check These ECONOMIES

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MALL 5 H.P. portable rail grinders quickly demonstrate these major money saving advantages on all rail grinding work. Interchangeable attachments can be furnished for cross grinding, surface grinding, switch point grinding and drilling; also, for pumping, chain and circular sawing.

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MAIL THIS COUPON TODAY! R. E. M.

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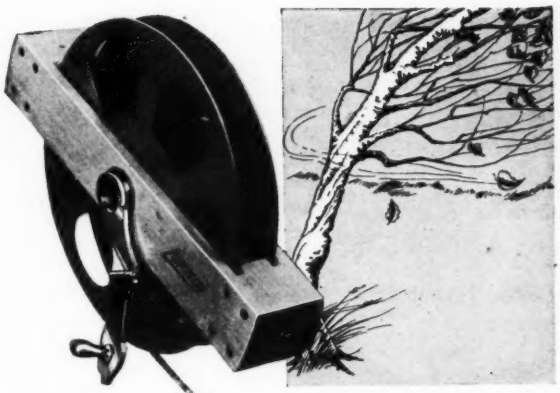

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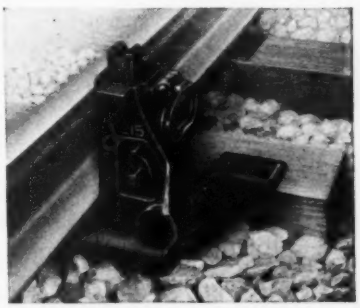

Section gangs get more done and greatly lower maintenance-of-way costs with Simplex Track Jacks.

There is a Simplex Track Jack, Rail Expander and G-Y Tie Spacer for every requirement.

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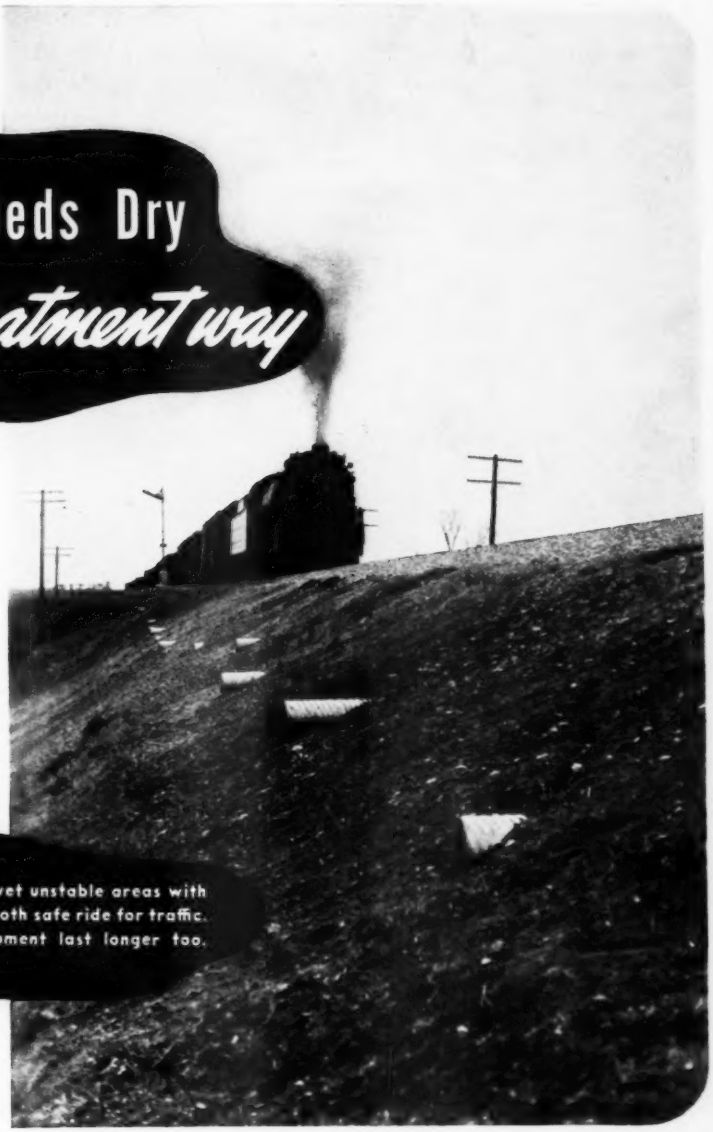
Keep Your Roadbeds Dry This *single treatment way*



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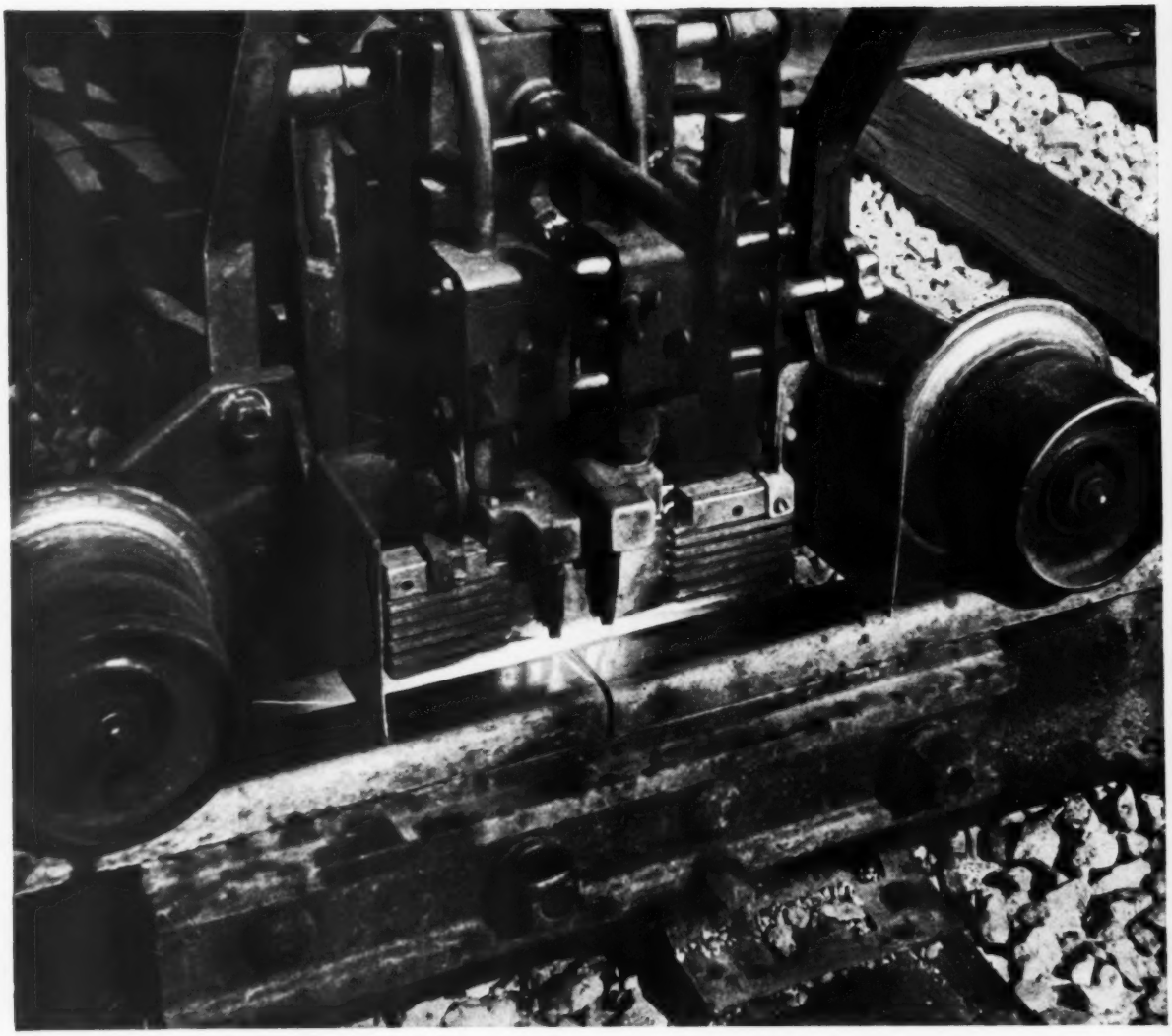

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